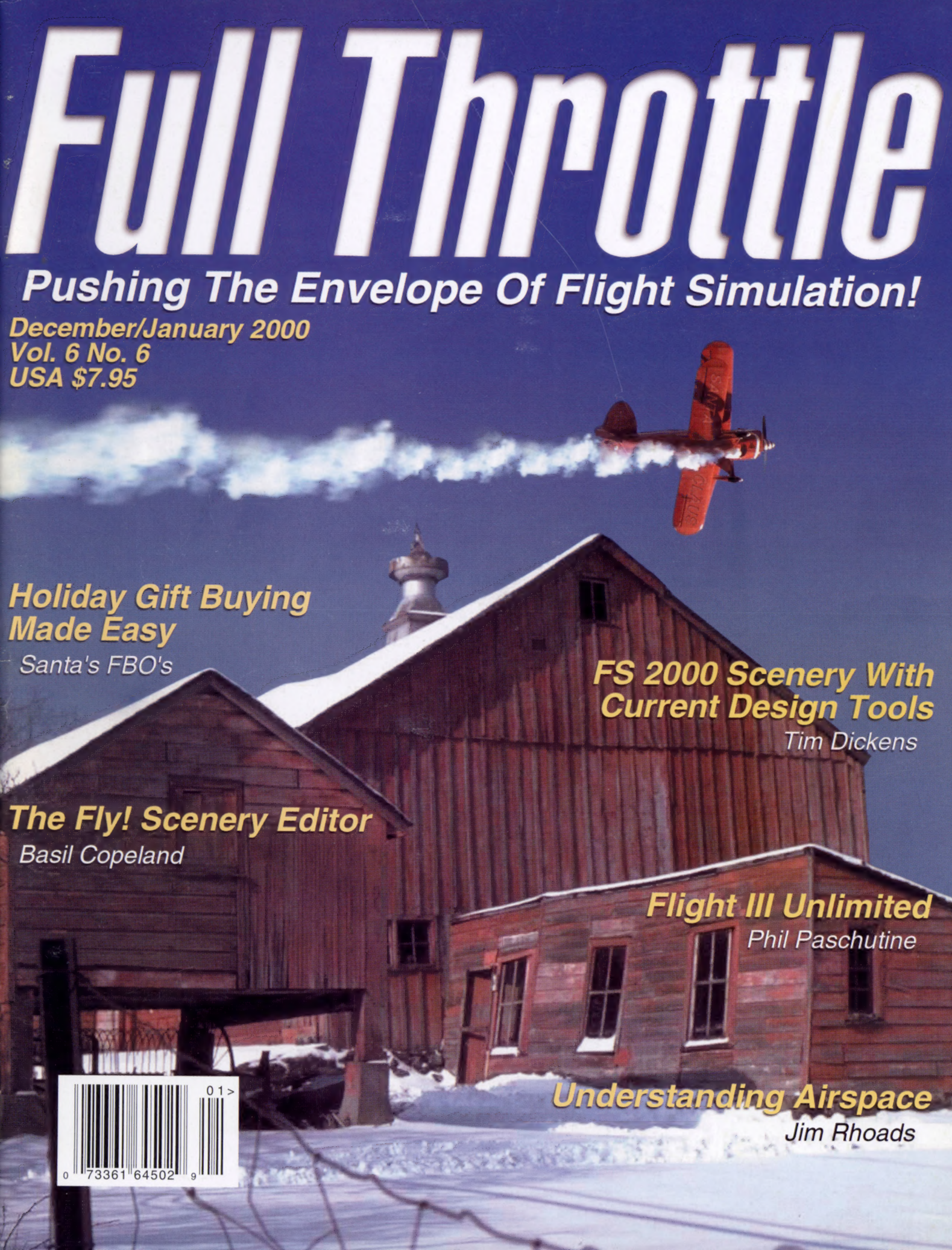
# Full Throttle

## Pushing The Envelope Of Flight Simulation!

December/January 2000
Vol. 6 No. 6
USA $7.95



**Holiday Gift Buying Made Easy**
*Santa's FBO's*

**FS 2000 Scenery With Current Design Tools**
*Tim Dickens*

**The Fly! Scenery Editor**
*Basil Copeland*

**Flight III Unlimited**
*Phil Paschutine*

**Understanding Airspace**
*Jim Rhoads*

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0 73361 64502 9

## FEATURE UPGRADES

1. Worldwide Scenery
   - 3D Terrain in 16-bit Color ..... WORLDWIDE
   - Detailed Cities..... OVER 50, 12 IN HIGH-RESOLUTION
2. Total Airports Available Worldwide ..... OVER 20,000
3. Total Aircraft Available..... 12
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   - Mooney Bravo..... TURBOCHARGED SINGLE
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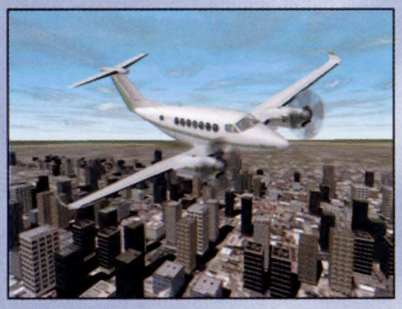
10. Instrument Panel Editor..... INCLUDED
11. Flight Training
    - Interactive Lessons by Rod Machado..... INCLUDED
    - Pilot's Handbook..... OVER 200 PAGES
12. Pentium III Processor ..... OPTIMIZED



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Perfect your IFR skills.

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- ☑ Use it to hone your skills, from VFR fundamentals to IFR approaches.
- ☑ Use it to fly the Concorde under the Golden Gate Bridge.

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# Full Throttle

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| Fulfillment: | Julie Snider |


**Pilot's Note:** This information is not intended for use in actual flying situations. While the information is as realistic as possible, you should not use it for actual flying instruction. *Safe flying!*

# From the Editor

The holiday season is here again! It's our favorite time to beguile our loved ones into accepting our flights of fancy and pick up that slick piece of hardware or software we crave! Or maybe we'll furnish one of our fellow simmers with a badly needed (and maybe well deserved) contribution to their perpetual system upgrades, so that they can run the latest graphic intensive programs unfettered by antiquated (meaning more than six months old <grin>) hardware. The one thing we can say for sure is that there is *always* some piece of hardware or software that even the most well equipped flight simulator enthusiast is longing for.

We are providing two features in this issue that will help guide you through the murky waters of product information, to give you an idea of exactly what is available (and advisable).

Since hardware peripherals, like yokes, joysticks, rudder pedals, etc., are always in high demand during the holiday shopping season, we provide our annual buyer's guide, called "Santa's FBO," to help you make informed choices (or solicitations) on the entire spectrum of available products.

If new, faster system hardware is what you are coveting, Rod White's feature "Gaming on a Budget" is just what you are looking for. That is, assuming that you don't want to sell your car or first-born child in order to finance this goal. Since the new simulator releases such as *Fly!*, *Flight Simulator 2000*, *Flight Unlimited III* and all of the various combat simulators require some serious system muscle to perform the way you like, you are well advised to reevaluate your concept of how to obtain a faster system. Just going out and laying down a pile of cash for a brand new system is likely *not* the most cost effective way to get the performance you are looking for. It will also help you to evaluate where your present system stands in terms of technology, so that you can determine the best way to go.

We hope you find these features useful when you make your inevitable trip to the mall.

## A bright new future for third-party development

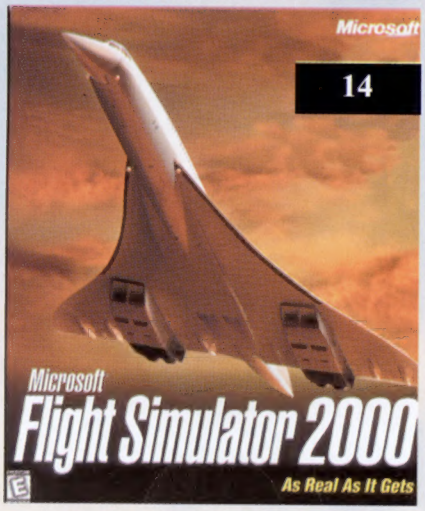
The scope of software add-ons that are and will be available for the latest flight simulation releases has expanded exponentially. All the new general aviation simulators released this fall have at least some sort of third-party development possibilities for creating new scenery and/or aircraft.

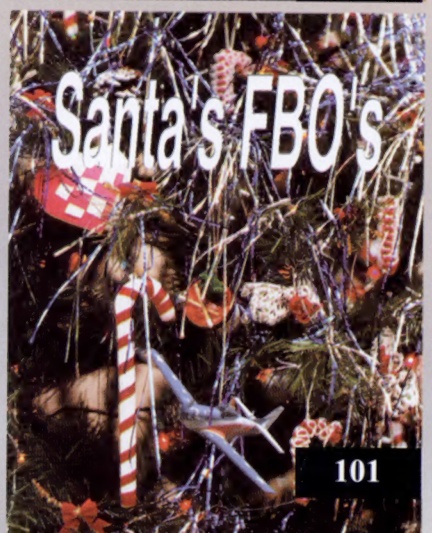
And of course, the established open platform of the Microsoft simulator programs is fully manifested in their recent release of *Flight Simulator 2000*. To facilitate this, we are providing you with the feature "Making Scenery for FS 2000 with Current Design Tools," which will give you some preliminary guidelines on how to make scenery work to its maximum potential with the tools you have right now.

The *Fly!* platform also accepts third-party development. In light of this, we offer you an excellent feature from Basil Copeland on using the *Fly!* scenery editor in order to show you just what you can do.

Both the entire staff and myself at *Full Throttle* magazine wish you the very best for the holiday season and for the coming new year!

**Keep the blue on top!**







## NOTAMs - New Products ..... 6

## FS 2000 Scenery with Current Design tools .... 14

Now that Microsoft *Flight Simulator 2000* (FS 2000) has been released, third-party scenery developers are rushing to import existing scenery or create new scenery specific to FS 2000. This article gives insight into how the FS 2000 scenery engine works and how to best use the present SCASM tools to get the best results possible.

## Flight III Unlimited .. 22

This has been a banner year for new general aviation flight simulators with releases from *Fly!*, *Flight Simulator 2000* and now *Flight Unlimited III* (FU III). *Full Throttle* looks at this latest version from Looking Glass Studios.

## The Fly! Scenery Editor: A First Look .... 33

The *Fly!* scenery editor has now been out for a few weeks and add-on sceneries are starting to appear. This article talks about the features of the scenery editor and a more detailed look at the basics of creating scenery for *Fly!*

## Understanding Airspace ..... 40

The airspace system is a measure of safety, protection and organization and for those of us who want to fly (or at least keep our licenses) and to make our simulation experience more realistic, we need to understand how airspaces work. This article describes classifications, airspace, flyways, routes and more.

## Round Robin Adventure : Baja California to Mazatlan, Mexico ..... 48

You'll enjoy this Round Robin...from the beautiful resort areas of La Paz on the Baja Peninsula, to Cabo San Lucas, across to Mazatlan, Puerto Vallarta and then back again to La Paz.

## Homebuilders' Corner ..... 58

This issue's Homebuilders' Corner looks at adding moving parts and landing lights to your finished aircraft design.

## Scenery Design Corner ..... 56

This issue looks at using USGS sample images to refine your image and textures.

## A Visit To The SATCO Kansas City Convention . 62

*Full Throttle* takes you to the Simulated Air Traffic Controller's Organization (SATCO) convention. Read about the convention and this organization.

## My Day At the Paris Air Show ..... 67

Read about the highlights of this summer's popular airshow at the Bourget airport near Paris. Aircraft from 40 countries were represented this year - military, civilian and experimental.

## Using new simulators without going broke (Gaming on a budget) ..... 77

Do you need to buy a new system or merely upgrade your existing system? This article will help you make the important decision.

## Airport & Scenery Designer 2.0 ..... 80

## Product Reviews ..... 73

This issue reviews *Grand Canyon*, *VIP Classic Airliners*, *Freespace 2*, *Jane's USAF*, and *Combat Pilot #1*

## FBO Santa Buyer Guide ... 101

## Year-end Index ..... 107

"European Air War's outstanding gameplay and wealth of features make it the current leader of the WWII simulation crop" *-PC Gamer, 89%, Editor's Choice Award*

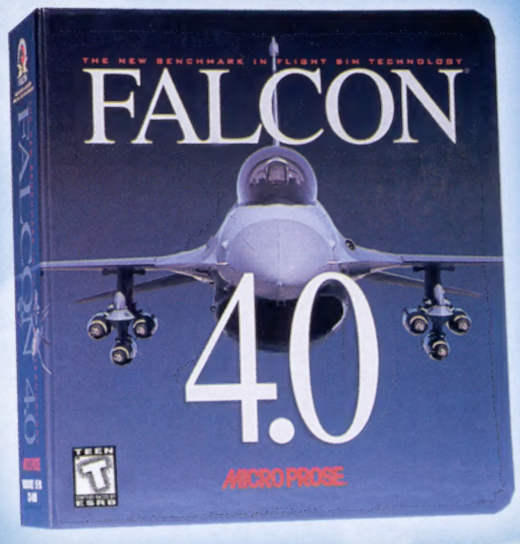
"This World War II simulation captured the feeling of being in a living, unpredictable combat environment better than any other sim released this past year" *-Computer Gaming World, 4 stars*

"European Air War succeeds at providing the experience that makes arm-chair fighter pilots believe they're truly leaving their mundane surroundings behind" *-Gamespot*

# RACKING UP

"No previous sim covers so many different weapons and so many tasks in detail... it's all here and it's all beautifully executed" *-PC Gamer, 95%, Editor's Choice Award*

"Falcon 4.0 is the deepest, most complex air combat sim yet... The campaign also creates the greatest sense of playing a small but important part of a huge battle" *-PC Gamer*



"Thoughtful gameplay design and the effort to bring players a sense of the true fighter pilot's experience can be felt throughout the game" *-Computer Games Strategy Plus*

EUROPEAN
AIR WAR
28 FLYABLE PLANES!
MICROPROSE
"European Air War combined huge dog fights, a great campaign system and realistic physics to make a game that was very hard to put down"
-IGN PC.com, Sim of the Year
"The care and attention to detail that went into every aspect of European Air War, from the hefty manual to the bomber nose art, represents a serious achievement"
-CNET GameCenter
THE KILLS!
"Bottom line: this sets the new standard in flight sims"
-Washington Post
"Falcon 4.0 is an incredibly detailed simulation that in many ways exceeds training systems in military use."
-Computer Gaming World
PC GAMER
ANNUAL AWARDS
BEST SIMULATION
1999
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Hall of Excellence
www.FlightSim.com
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# NOTAMS: New Products

## USAF

### United States Air Force

Climb the pyramid to be the top pilot of the most advanced air force in the world: the USAF. Fly and train over US soil in the F-16C Falcon and A-10 Warthog or an arsenal of six other planes. Then relive great historic air battles flying the rugged F-4E over Vietnam or the powerful F-15C in Operation Desert Storm. Finally, push the envelope flying the menacing F-117 Stealth Fighter and ultra-modern F-22 Raptor as you project the power of the United States in futuristic campaigns over Europe.

If that's not enough, take your skills to the Net flying against other aces on JanesCombat.Net.

**Features:**

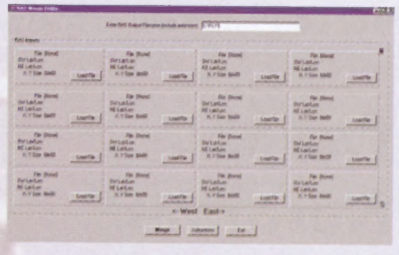
- F-105 "Thud"
- F-4E "Phantom"
- F-15C/E
- F-117 stealth bomber
- F-16
- A-10 "Warthog"
- F-22

*USAF* is your advanced weapons platform, featuring new graphics and terrain engine, rolling oceans, shimmering water and metal, 3-D clouds and rain.

For those of you who aren't familiar with the term, NOTAMs is an acronym for NOTices to AirMen. The U.S. Government issues NOTAMs regularly. This issue of Full Throttle includes our version of NOTAMS — an expanded new products section. It's a regular part of our magazine. The products listed are compiled from press releases and information provided by the respective authors and companies who supply the products. We've taken steps to verify the information with each author or company, but cannot be responsible for inaccurate features, specification or availability dates.

# Dem2Ras

## Fly! Scenery Utility

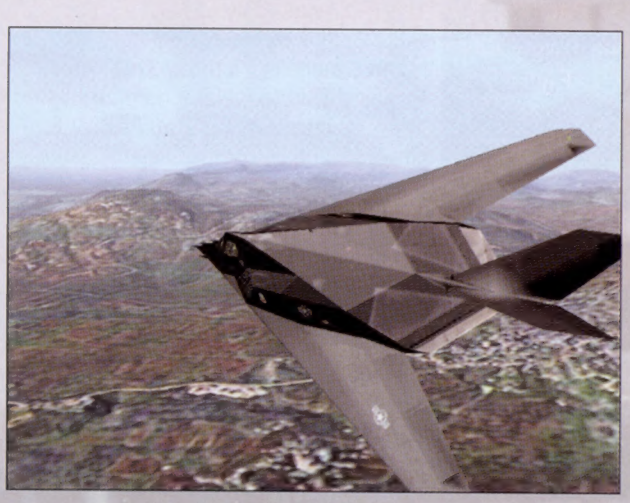


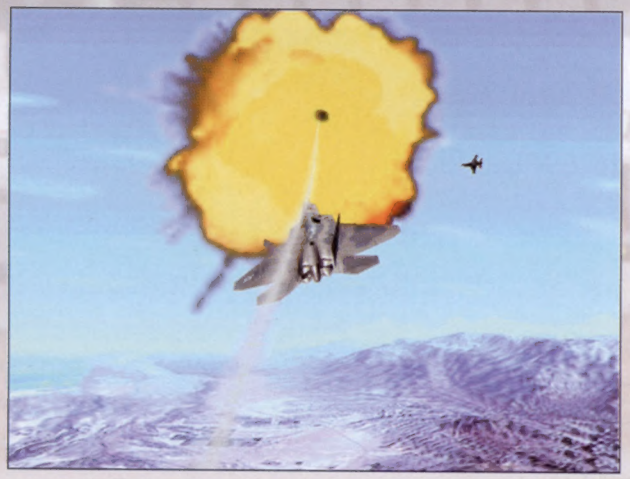
Robert Parsons has created a clever utility that converts USGS DEM files to RAZ format files for use in Terminal Reality's *Fly!*

To use the program, simply download a DEM file from the USGS site (http://edc.usgs.gov/glis/hyper/guide/1_dgr_demfig/states.html).

*Dem2Ras* will easily convert the file to RAS format for use with *Fly!*'s editor.

| Dem2Ras |
| --- |
| Author: Rob Parsons<br>Download: http://users.multipro.com/rparsons/dem2ras.zip<br>E-mail: rparsons@tappublishing.com<br>Freeware |





| USAF | Jane's / Electronic Arts<br>209 Redwood Shores Parkway<br>Redwood City, CA 94065-1175<br>Internet: http://www.janes.ea.com<br>SRP: $39.95 U.S. |
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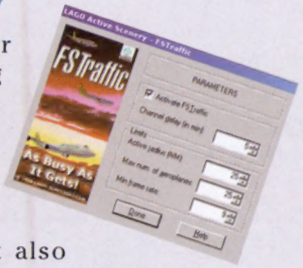
# FSTraffic

## Dynamic Traffic Utility




*FSTraffic* is a new utility for Microsoft *Flight Simulator* letting you generate traffic around any airport in the world. It claims that it will expand your flying skills as you fly with up to 30 other airplanes taxiing, taking-off and landing around you. It also allows other moving objects, such as buses, tow-trucks, etc.

Based on LAGO's Active Scenery technology—as seen on *The Triangle* and *Mad Dog*—*FSTraffic* is interactive. It lets you create ILS databases, customize traffic, record and see tracks, convert and see them all within Flight Sim. An FS2000 version will be released soon.

| FSTraffic | Lago SNC<br>P.O. Box 293<br>22100 Como, Italy<br>Internet: http://www.fstraffic.com<br>E-mail: 100411.3660@compuserve.com<br>SRP: $49.95<br>Registration: $21.50 U.S. |
| --- | --- |

# Pacific Northwest

## Mega Scenery For FLY!

PC Aviator announced the first official scenery expansion for *FLY!*, Terminal Reality's highly successful general aviation simulator, titled *MegaScenery Pacific Northwest for FLY!*

Originally released for use with Microsoft's *Flight Simulator* and *Combat Flight Simulator*, *MegaScenery Pacific Northwest for FLY!* will enable desktop pilots using *FLY!* to soar the skies above the USA's Pacific Northwest landscape that has been recreated by the MegaScenery product.

*MegaScenery Pacific Northwest for FLY!* covers 65,000 square miles of the Pacific Northwest and includes Washington State, Northern Oregon and Southern British Columbia, Canada, all recreated using satellite imagery from the Landsat.

*MegaScenery Pacific Northwest* provides a continuous area over six times greater than the stock *Fly!* scenery for the Pacific Northwest area.

| Pacific Northwest for Fly! | The PC Aviator Pty Ltd.<br>Suite 6, 219 Balaclava Rd<br>North Caulfield, Victoria, 3161, Australia<br>E-mail: crew@pcaviator.com.au<br>Internet: http://www.megascenery.com<br>SRP: $39.95<br>Available: First Quarter, 2000 |
|---|---|

# X-Plane 5.11

## X-plane Upgrade

Austin Meyers of **X-plane** has announced the latest version of his popular sim, V.5.11.

All customers with CDs of version 4.42 or newer can download version 5.11B for free.

Customers with CDs of version 5.0 or later will be able to download through version 5.99 for free.

### New features

- Fully flexible panel backgrounds
- Situations now save more information
- Blowing snow drifts across the runways
- Rocket engines are now available
- Visible NDB, VOR, localizer, glideslope and marker-beacon transmitters
- Moving frigates and aircraft carriers
- F-18 Hornet
- F-105 Thud
- F-4 Phantom
- Flight modeling is now more powerful
- More altitudes for wind
- New concrete and asphalt runway textures

| X-Plane | Laminar Research<br>1005 Brentwood Crt.<br>Columbia, SC 29206<br>Phone: (803) 738-0910<br>E-mail: austin@x-plane.com<br>Internet: http://www.x-plane.com<br>SRP: 199.00 U.S. |
|---|---|

# Professional Flying...

The MD-83 Captain's panel on climb out...

MD-83 centre panel with comms, autopilot and engine read-outs.

The Boeing 747-400 Captain's view at Zurich with 'glass cockpit' panel.

The Boeing 747-400 centre panel view shows important information clearly.

# AIRLINE SIMULATOR 2

# ...Real Simulation

**Fed up with all 'out of the window fancy graphics' AND NO REAL flying? If it is flying realism you want then Airline Simulator 2 is the simulator you have been waiting for!**

- Developed by real airline pilots and aviation professionals over three years
- The most realistic aircraft handling ever achieved on a PC-based flight simulation with all new flight models of MD-83, MD-88 and B747-400 aircraft. Plus additional aircraft, including B737, B767, B747-357, A320 and Shorts 360.
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- Highly sophisticated flight equations based on true inertia systems and detailed airflow calculations and forces Programmed with accuracy up to FL500!
- Wind turbulence, rain and snow as well as runway surface calculations allow realistic ground handling
- Explore the edges of the aircraft flight envelope.....You deal with asymmetric lift, asymmetric drag, flamed out engines and much more.
- Aircraft Abstraction Layer (AAL), the technology behind the new flight model makes flying easy, and teaches the right, real world handling techniques used by real world pilots
- Autopilot, Main Control Panel (MCP), Flight Management Computer (FMC), Thrust Computer, Ground Proximity Warning System (GPWS), Traffic and Collision Avoidance System (TCAS) and many more systems.
- Aural Alarms (e.g. GPWS, TCAS, configuration alarms), voice communication with the first officer and improved sounds for touch down, stall warning and other aircraft related sounds have been implemented using real world sounds.
- Fly with TRUE 3D! Red-green anaglyph glasses are included to let you take advantage of the 3D Advanced Graphics System module included.
- Multi-player flight simulation via IPX Network. Up to 4 planes can see each other with external visuals together with proper TCAS simulation. The included Scenery Viewer (called Ernie) allows you to view scenery and is useable as a radar screen for networked multi-player sessions.
- Comprehensive manual including 150 pages of authorised reproductions of Aerad airport and ILS charts. Further, 3 authorised reproductions of Aerad en-route charts covering Europe and North Atlantic are included as well as checklists for the MD-83, MD-88 and B747-400 aircraft.

**IMPORTANT – AIRLINE SIMULATOR 2 IS A HIGHLY DETAILED FLIGHT SIMULATION EXPERIENCE. ONLY EXPERIENCED PC PILOTS SHOULD APPLY!**

Available in the USA from
FLIGHT 1 SOFTWARE
http://flight1.com
Tel: 1-877-PC Pilot

Published in Europe by
The Associates
http://flightsim.co.uk
Tel: +44(0)1494 511103

Developed by
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# WeatherTAP

## Real World Weather Information

Real pilots need real weather information.

Even if you are an armchair pilot, chances are you want or need to know the most current weather forecasts.

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- Complete aviation weather package
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| WeatherTAP | TAP Publishing Company<br>174 Fourth Street<br>Crossville, TN 38555<br>Phone: (800) 337-5263<br>Fax: (800) 423-9030<br>Internet: http://www.weathertap.com<br>Service: $5.95 per month |
|---|---|

# AutoMETAR

## Metar data for FLY!

*AutoMETAR* automatically downloads the latest USA METARs weather data directly from the NOAA into *Fly!*, effectively giving the sim pilot "real world, real time" weather.

NOAA METAR files are updated at least every hour on or about the forty-five minute mark. Unfortunately, *Fly!* has no mechanism to update METAR data while in-flight except by going to the Environment screen and clicking Import METAR.

Nevertheless, *AutoMETAR* gets the latest METAR and sticks it into the CurrentMETAR.txt file every 15 minutes or so.

# Comm1 IFR

## IFR Radio Simulator

E-Publishing has announced their eagerly awaited release of *Comm1 IFR* radio simulator program. Following the lead of their popular VFR program, *Comm1*'s IFR trains you in the art of proper IFR phraseology based on the many different possible situations that you would encounter in the real world.

*Comm1 IFR* demystifies the IFR/ATC experience and trains you in the privacy of your home, testing you knowledge, raising your proficiency level and saving you money, as opposed to learning in a real aircraft.

Learn to master the art of proper IFR radio communication in the privacy of your home.

- Over 9 hours of comprehensive radio training
- Realistic rapid-fire ATC exchanges
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- 76 detailed briefings
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| Comm1 IFR |
|---|
| E-Publishing Group<br>113 East Church Street<br>Frederick, MD 21701<br>Phone: (888) 333-2855<br>Fax: (301) 695-5620<br>Internet: http://www.e-publishing.com/comm1<br>Intro price: $119.95 |

| AutoMETAR | Dauntless Software<br>E-mail: inquiries@dauntless-soft.com<br>Internet: http://www.dauntless-soft.com<br>Freeware |
|---|---|

# DeskTop Wings

## NOAA charts

DeskTop Wings is now an authorized dealer for the official National Oceanic and Atmospheric Administration (NOAA) charts. As a special offer, standard shipping and handling charges are waived on orders of the IFR Enroute High Altitude chart sets.

Completing their coverage of the "lower 48" United States, Desktop Wings now offers a complete set of the three IFR Enroute High Altitude charts for $11.85 (also available separately for $3.95 each). These are intended for flights about Flight Level 180 (18,000 feet), and are of particular interest to business and commercial jet aircraft pilots. The three-color charts show all high-altitude VOR beacons and the jet routes (J-routes). They show coastlines and the boundaries of Air Traffic Control Center and special use airspace.

DESKTOP WINGS

Desktop Wings is also offering the United States VFR/IFR planning chart. These 40- by 27-inch charts cover the eastern half of the country on one side—including enlarged coverage of the busy Washington-to-Boston corridor—and the western half on the other side, plus a table showing the great circle distances between 175 major US airports. The four-color charts show areas of water, military, restricted and prohibited airspace, and low-altitude Victor IFR routes.

These charts come folded, but can be ironed to reduce the creases, making them suitable for mounting on a wall.

The chart costs $4.50; if you buy two copies, you can make an 80- by 22-inch wall poster covering the entire lower 48 United States.

| NOAA Charts | Desktop Wings<br>P.O. Box 422<br>Dublin, PA 18917<br>Phone: (800) 848-6198<br>Fax: (215) 453-0286<br>E-mail: bpoor@netreach.net<br>Internet: http://www.desktopwings.com |
|---|---|

# Twelve O'Clock High

## Combat simulation

After the stunning defeat of the Luftwaffe during the Battle of Britain, Germany turns its mighty war machine towards Russia with hopes of defeating the great empire. Much to Hitler's dismay, his troops are held at bay by both an unforgiving winter and the stubborn, battle-hardened Red Army. The tides of war begin to turn against the Reich, and Germany must suddenly scramble to maintain the strong industrial complex that has helped it reign supreme.

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| Twelve O' Clock High |
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| TalonSoft, Inc.<br>White Marsh Business Center I<br>5020 Campbell Blvd., Suite F<br>Baltimore, MD 21236<br>Fax: (410) 933-1740<br>Internet: http://www.talonsoft.com/products/btr.html |

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## Aerial combat

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- Multiplayer mode features Internet and LAN mode, as well as compatibility with *M1 Tank Platoon III®*.
- Based on actual U.S. Army attack helicopters and tactics

| Gunship III | Hasbro Interactive<br>50 Dunham Road<br>Beverly, MA 01915<br>Phone: (978) 921-3882<br>Fax: (978) 921-3770<br>Internet: http://www.hasbrointeractive.com |
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| Precision Pilot | Interactive Associates (CDC) Ltd.<br>Units A2/A3 Edison Road, St. Ives,<br>Cambridgeshire PE17 4LF, UK.<br>Internet: www.flightsim.co.uk |
|---|---|

# Flanker 2.0

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- Ships with Roger-Wilco voice/chat software
- Campaign mission module includes resource management, realistic enemy engagement and save now/play later mission save system
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| Flanker 2.0 | Mindscape, Inc.<br>88 Rowland Way<br>Novato, California 94945<br>Phone: (415) 895-2000<br>Fax: (415) 895-2102<br>Internet: http://www.flanker2.com<br>SRP: $49.95 U.S. |
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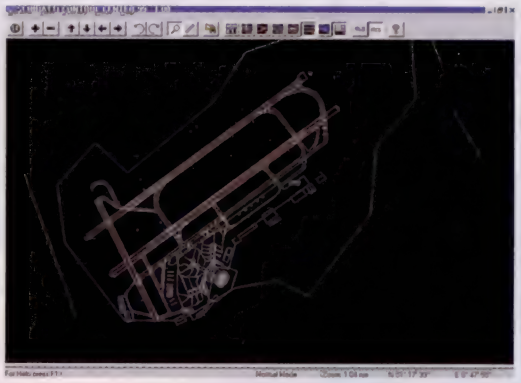

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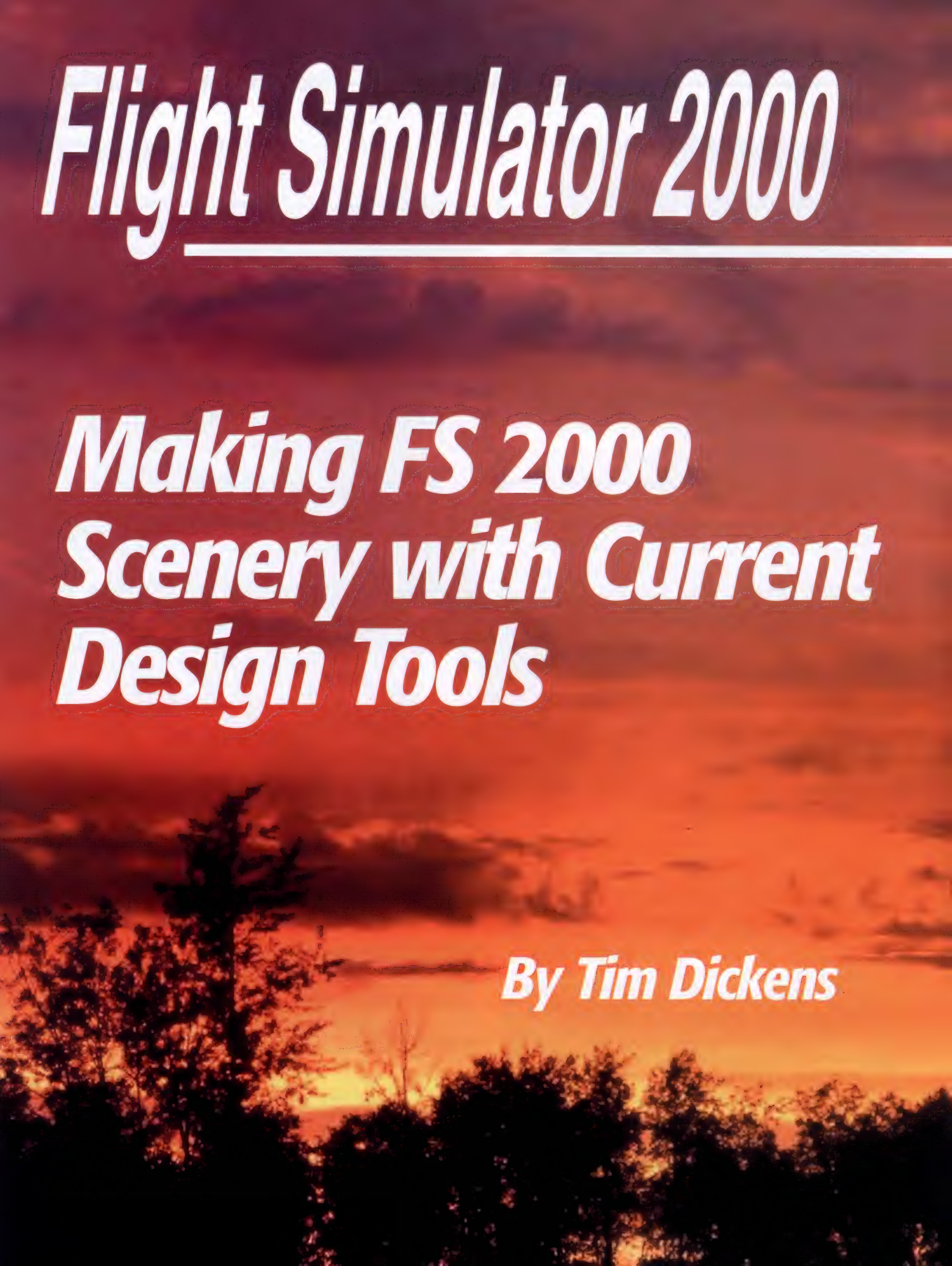
# Flight Simulator 2000

# Making FS 2000 Scenery with Current Design Tools



By Tim Dickens

Now that Microsoft *Flight Simulator 2000* (FS 2000) has been released, third-party scenery developers are rushing to import existing scenery or create new scenery specific to FS 2000.

Although the default FS 2000 scenery is a tremendous advance from FS 98 and before, "detail guys," like myself, always have more information on specific airports and the surrounding area. And of course, the first thing we want to do is bring this detail into the FS 2000 environment. This is one of the things about the Microsoft FS platform that makes it a much more complete hobby, rather than just a game.

This article will give scenery designers insight into how the FS 2000 scenery engine works and how to best utilize the present SCASM tools (from Manfred Moldenhauer) to get the best results possible. I will discuss the differences between the new scenery engine and the FS 98 and before engine and how to format your SCASM source files for FS 2000.

## What's new in the FS 2000 scenery engine?

A lot is new in the FS 2000 scenery engine. Microsoft designed this new scenery engine from scratch to take advantage of the new 3-D hardware and software capabilities available to today's computer consumers. In order to do this, it was necessary to create a completely new scenery engine. Drawing routines and object sorting can now be performed by hardware in most cases. Also, the computer power (CPU speed, graphics cards) used by the average flight simmer has advanced substantially since the era of FS 5-FS 98. This opens a world of possibilities for the scenery engine that were simply not practical before.

The good news is that Microsoft has continued their tradition of supporting third-party scenery, which we all have enjoyed over the years. You must, however, keep in mind that the way FS 2000 draws objects on the screen has improved significantly. Also, there have been a variety of third-party design tools and different methods for constructing scenery among designers. It would be impossible to keep track of all of these and automatically make everything 100% compatible. This means you may use your present tools, but perhaps in a different way, depending on what you want to do with the scenery. It is also necessary to understand the new scenery components and how to interface with them.

The most significant change in the FS 2000 scenery engine by far is the end of the old "flat FS world," in favor of the more advanced 3-D elevated terrain model. Based on this, the whole realm of scenery design has been given a new dimension. So, the first decision a scenery designer must make is whether to add scenery detail to the new FS 2000 3-D terrain or simply *flatten* the new terrain to conform to the flat-world model. My opinion is that utilizing any flat-world components of existing scenery is like buying a Porsche and installing a Yugo engine. But this is just my preference. You may feel differently. We will show you how to use both.

## Comparing the two scenery engines

In order to determine how you want to port your scenery into FS 2000, a side by side comparison of the two scenery engines is in order:

### Basic terrain models

In FS 98 and before, it was necessary to render the terrain using flat, synthetic textured tiles. These included many default Microsoft textures, and in many cases, the use of "hole seeds," such as SEED50.R8. The simulator was able to apply these textures, along with the default ones, to any synthetic tile, at a given pixel per meter (PPM) resolution (about 15-17 PPM in most parts of the world).

In FS 2000, these synthetic tiles are not used at all, and I honestly can not think of a good reason to use them for designing FS 2000 scenery.

### Object sorting

In FS 98 and before, the simulator determined the drawing order of all of the objects according to type. The scenery coding could also determine the drawing order by assigning different types/attributes to the respective objects. The FS sorting and drawing order looked like this:

1. Synthetic tiles
2. *PerspectiveCall2* objects
3. Ground polygons (no PerspectiveCall)
4. *PerspectiveCall* objects and synthetic tile mountains

Synthetic tiles were always drawn first, and therefore, were covered by everything else. In the flat world, this was not a problem. The two perspective commands, PerspectiveCall and PerspectiveCall2, were used primarily for 3-D objects. One perspective command or the other could be brought to bear when the designer needed to predetermine what the drawing order of all objects should be.

For example, when using the present SCASM command TexRelief for elevated mesh terrain, one could use either type of perspective. The effect was that if PerspectiveCall2 were used, it would be possible to place anything further down the list, like ground polygons, on top of it. However, since coastal polygons

are in fact ground polygons, they would bleed through the terrain. You could see the coastline right through the mountain. So in areas where the coastline is within visual range of the aircraft, and there was significant terrain elevation in between, it was advantageous to use PerspectiveCall.

In FS 2000, the Z-buffering determines the drawing order of objects. To avoid a lengthy technical description, the Z-buffer uses distance from the user's point of view (from the aircraft) as the sole parameter for object drawing order. What this means to the scenery designer is that you no longer need to juggle object types to avoid bleed-through problems. The Z-buffering takes care of this.

### Visual scenery

Over the years, this has also been called *Section 9* scenery. In short, this comprises everything you see on top of the terrain. In FS 98 and before, the terrain *was* the synthetic tiles. Now it is the elevated mesh terrain. Visual scenery is composed of all the ground polygons, taxiways, runways, roads, rivers, lakes and 3-D objects, like hangars, buildings, etc.

FS 2000 uses the same native scenery code for visual scenery. So, your present SCASM or FSASM tools will work just fine for creating this aspect of the scenery. Here we will offer you some protocols that will allow you to take advantage of the new terrain model in FS 2000 and build your visual scenery on top of it.

This discussion does not include re-texturing or modification of the existing FS 2000 elevated terrain. More research and development will be needed here, since this is not visual Section 9 scenery. Special tools will need to be constructed for this purpose.

## RefPoint

In order to get the best results with your visual scenery, and particularly with ground polygons, it is important that you understand the fundamentals with respect to *RefPoint*.

*RefPoint* is a command used by both SCASM and FSASM. Its purpose is exactly what the name implies—it is a reference point in space (latitude/longitude/altitude) for the simulator to use when positioning any object into the drawing instructions. It simply tells the simulator where the object is supposed to be. When drawing objects, the *drawing points* are always expressed in relation to the RefPoint.

There are two types of RefPoints that we need to be concerned with here:

### RefPoint 2

This reference point must always be expressed with the altitude command expression "E=*x*," as E= 300 for an object whose RefPoint is 300 meters above mean sea level (MSL). The object will always be drawn at that exact altitude.

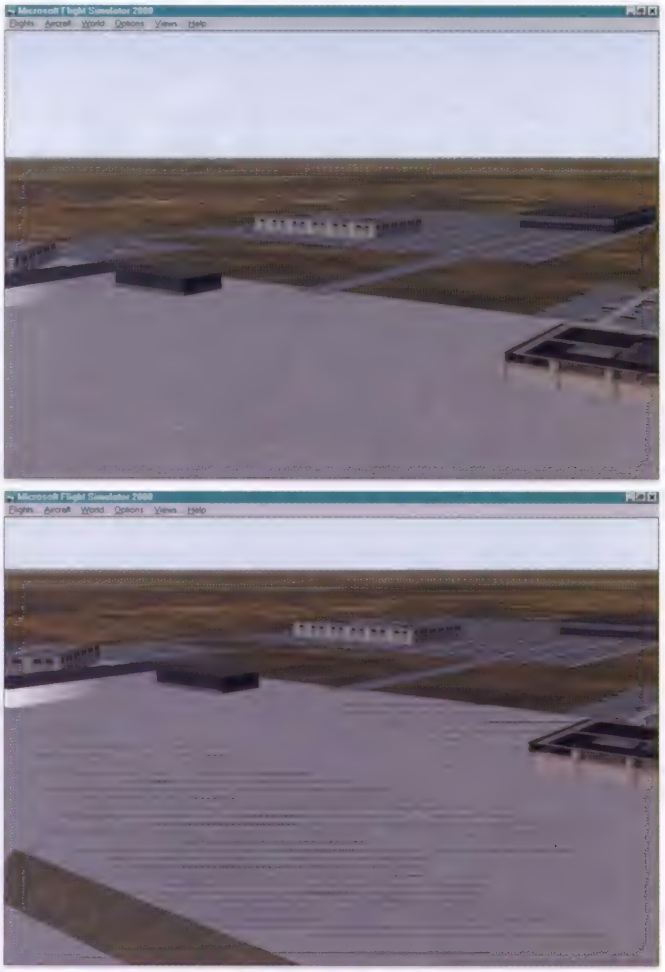
### RefPoint 7

Here, the reference point is always considered to be *at tile altitude.* No elevation command is used. It should be noted that FS 2000 now uses *terrain altitude* here. The RefPoint will be assigned to the actual altitude of the terrain underneath the object's latitude/longitude coordinates.

## Polygon drawing

The present commands used in visual scenery for polygon drawing all work, except that for ground polygons to display correctly, I recommend using RefPoint 2, with the correct terrain elevation. If RefPoint 7 is used, the polygon may show up in the scenery with odd visual effects, particularly when smaller polygons are placed on top of larger ones.

This is due to the Z-buffering, where any polygon lying on top of the elevation grid must be identified with an altitude command.



*The figure on top shows a polygon for an apron using RefPoint 2. The polygon on the bottom used RefPoint 7 and exhibits visual problems.*

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by JEPPESEN

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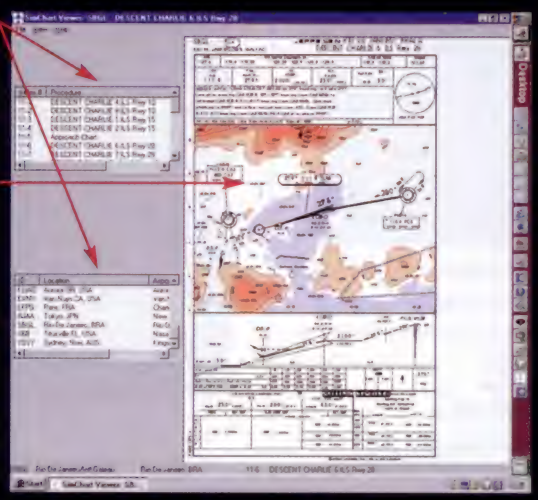

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# Making FS 2000 Scenery with Current Design Tools

## Taxiways

Taxiways work as-is, providing that RefPoint 2 is used with the proper elevation. Since taxiways almost always sit on top of a larger airport polygon, use of RefPoint 2 can be seen as mandatory here. Taxiway lighting also responds correctly to the SCASM lighted taxiway selector. The taxi lights are displayed using the new FS 2000-style illuminated dots, which are much easier to see at night.

## Runways

The present commands draw the runways exactly as before, except that, at this time, I *cannot turn out the lights!* There are obviously some new op-codes here, which will take a bit of time to decipher. The bottom line is that your runways should show up just fine.

## Line drawing

The current line drawing commands work as-is; no changes are necessary. Note that the new night illumination rules (below) apply. In the context of the line tool, that means that any color you select for a dotted line will be illuminated both day and night.

*Line commands and the command DotLine work as before.*

## Roads and rivers

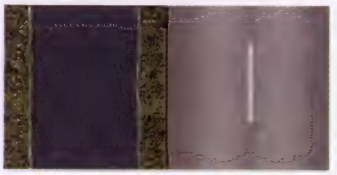
The RoadMoveTo and RoadLineTo commands work as-is; no changes are necessary. Selecting lighted roads calls the little moving headlights that you see in FS 2000.

FS 2000 assigns an elevation to every segment point, according to the closest point on the 30 arc-second elevation grid. This means that *longer segment lengths for roads are not a good idea,* even on relatively flat terrain. I have found that, using ASD, about 2,000 meter segment lengths are working fine.

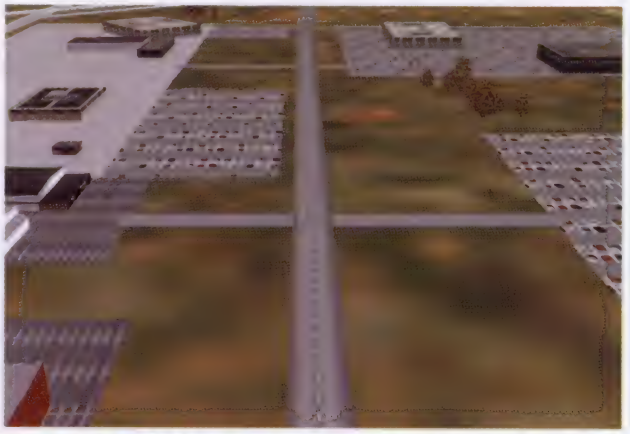
Polygon rivers will no longer work correctly. They will not follow the contour of the terrain as the roads do. But, the native river commands in the FS section 9 scenery are the same as the above road commands, except of course you never want a river night lighted.

So, using RoadMoveTo2 or RoadLineTo2 for rivers will do the trick. These commands do not allow lighting. Simply apply a river texture to it.

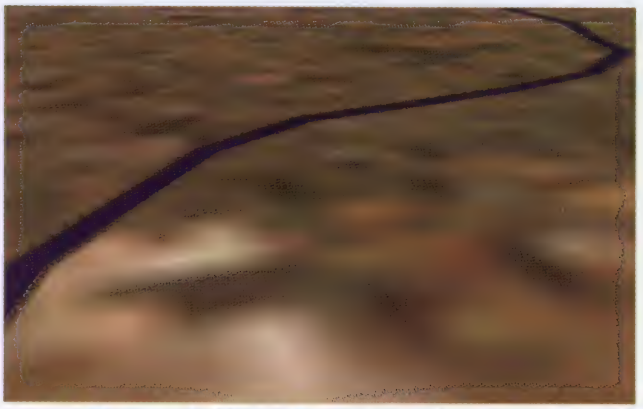
You can use custom river or road textures, like these, and if scale 1 is used, they will always be drawn on the terrain exactly as they appear on the bitmap.



*Here is an example of two textures I am using for rivers (left) and roads (right).*



*When using scale factor 1, your custom road texture will appear perfectly, with your center-line drawn exactly in the middle of the road.*



*The same holds true for a custom river texture.*

## Coastal polygons

These work as before with no problems. It should be noted that the water texture used in the default FS 2000 scenery is a much more realistic gray/blue tone, not the mailbox blue from

WATER.R8. It is pretty much the same as that used in CFS and what I have used for quite a while for water texturing (I hate that mailbox texture). But it is important to remember that LayerCall no longer applies, as mentioned above.

## Lakes

The same rules for ground polygons exist here. If you have a relatively flat surface and a RefPoint 2 command, they will display as before. If you have a flat surface in FS 2000 on which to place a large polygon, that's great. The FS 2000 terrain model is relatively accurate, so chances are the correct geographic location for the lake should be pretty flat. If not, you can always use the flatten switch in the FS 2000 SCENERY.CFG file.

## Elevated mesh terrain

The present elevated mesh terrain command *TexRelief* works as before in FS 2000, if the flatten switch is used for the entire area. It does not have the hard surface that it has in CFS. Like FS 98, you just fall through the surface textures. It is also rather hard on the frame rates.

## Range and V1/V2 parameters

If you're not familiar with these commands, let's take a closer look at them:

*Range* is expressed within the Area block command. It simply tells the simulator when to load an object into the drawing queue, according to the distance (in kilometers) from the object to the aircraft. It does not tell FS to actually draw the object; it tells it to get ready to draw the object.

*V1* is expressed within the RefPoint command. This tells FS when to draw the object, according to distance (in meters) from the aircraft. Ideally, V1 should be equal, or of a slightly lesser value, than the range command. So if you use a *Range* command of 12 kilometers (12,000 meters), then your V1 statement should be something like 11,000 meters, or perhaps less.

*V2* can be best defined as the lateral distance (in meters), as your view rotates, that the simulator will still draw the object. So if you turn the aircraft and the object is no longer in view, it is not included in the scenery drawing by FS. This is a tremendous frame rate saver.

These commands remain mostly the same, though the V2 command seems to work differently. FS 2000 wants a wider parameter here. For example, for an object 50 meters wide, using a V2 parameter of less than 200 seems to cause the object to "wink out" as you turn the aircraft. For the old scenery engine, a V2 parameter of 50 or 75 meters would have been fine.

## Seasonal change

The SCASM command *6F8*, for declaring a seasonal change, works as before. There are additional season commands in FS 2000 that we do not know at this point. The default scenery uses three textures for seasons (winter, spring/summer and fall) and one additional "white out" texture for snow covered ground. This white out texture seems to respond to the weather. This one will take a little time to figure out.

## Night lighting

This is where everything gets turned upside-down. The old rules go out the window. Fortunately SCASM, in its present format, does everything we need. Here is how night lighting works in FS 2000:

1. The old *constant colors* from the FS5.PAL color palette no longer illuminate at night. They display as any other color would without using lighting commands in the polygon drawing. In other words, they stay dark.

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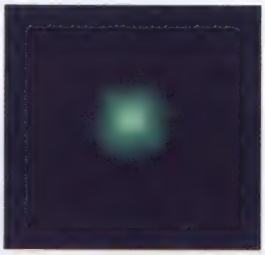
2. Any color can be night lighted in FS 2000.
3. Night lighting is achieved by using the *shaded* command in polygon drawing. For example, a non-textured polygon drawn using ShadedColor/ShadedPoly will illuminate. SurfaceColor/Poly will not. Also, ShadedTexPoly will illuminate, and TexPoly will not.
4. The above can be negated by using vector points for the polygon drawing points. So in the polygon drawing routine, if you use the command VecPoints, the polygon will not be illuminated at night. This is a good option when you want the shaded polygon effects by day and no illumination at night. Using the regular Points command in conjunction with ShadedPoly or ShadedTexPoly will illuminate the polygon. *Note: I have only tried this on the automatic VecPoints( a command.*
5. The use of direct Fs5.PAL color palette drawing (69 instead of f0) will *always* illuminate a non-textured polygon. Here, the hex value for the palette index is used in conjunction with the command 69. So for example, the perfect white color on the Fs5.PAL color palette is index number 31. This translates to the command "001f 69." *This will produce a lighted polygon, even if a standard SurfaceColor/Poly command is used!* The same holds true for the rest of the palette indexes.



*FS 2000 displays a much more appealing illuminated dot. The present SCASM coding produces the same effect.*

6. Illuminated dots still work, but two commands are not supported: DotPt and BigDot. The commands DotLine and Dot still work fine. Also, the running bit timer 282 commonly used for beacons or flashing lights still works the same.
7. The day/dusk/night switch, 28C, works as before.
8. Illuminated dots in FS 2000 have a larger appearance, with a visual halo effect. The present SCASM coding also produces this type of illuminated dot.

*Since any color may be night illuminated in FS 2000 and standard .bmp textures may be used, we have a whole new world of night lighting to explore.*

## Polygon transparency

This works the same as before. The only change is that it is now possible to combine a ShadedTexPoly command with the transparency code BitmapMode( 1 ). In FS 98 and before, this would eliminate the transparency effect. And of course, as outlined above, the ShadedTexPoly command must be used if you want the polygon night illuminated.

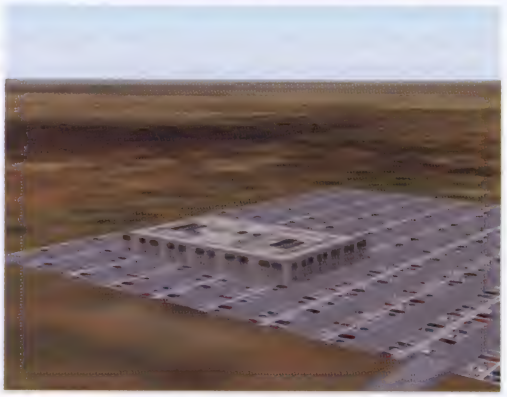
## 3-D objects: buildings, hangars, taxiway signs and windsocks

Placing objects using RefPoint 7 seems to work the best. The 3-D object will always appear directly on top of the terrain at the given coordinates. It acts just like the previous scenery engine, where RefPoint 7 always placed objects at *tile* altitude.

Using RefPoint 2 with an elevation command still works as before, but it is tricky. If you have a flattened area, it is absolutely no problem. But if there is any deviation in terrain elevation within the airport vicinity (and there usually is), the RefPoint 2 object may end up floating above the terrain or be buried below.

All things considered, using strictly RefPoint 7 for all buildings, hangars, windsocks, signs, etc., would be the best way to go.

This also holds true for "standard" FS building commands. It should also be noted that FS 2000 takes the building command and automatically re-textures it with the up-to-date textures presently used. They also have the same night lighting effects.



*A SCASM "standard building" rendered in FS 2000.*

I hope you have found this report useful for your scenery design efforts. *Full Throttle* magazine will keep you up to date on all aspects of scenery design for FS 2000 as they become understood. In the meantime, have some fun!

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  Airport 2000 vol 2 includes the latest in panel development technology with moving map and flight plan display, Flight Management Computer, working fire panel to simulate engines fires, pushback sequence with 90 degree turn, accurate start sequence requiring checklist, APU, air-conditioning…

- **INCLUDED:** Airport diagram, approach charts, pilot's manual.

- **MINIMUM CONFIGURATION:** Microsoft® Flight Simulator 98 or Flight Simulator 2000 - Pentium 200 MHz - 32 Mb Ram. Accelerator graphic card highly recommended. Compatible with most of commercial add-ons available on the market.

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# A Close Look at Flight Unlimited III

**This has been a banner year for new general aviation flight simulators. *Fly!*, *Flight Simulator 2000* and now *Flight Unlimited III* (FU III) have arrived since August. However, this can be a flight simmer's nightmare when choosing the right simulator! Do you want awesome cockpits, local scenery, world scenery, IFR only, VFR only, both? Real weather, generated weather? More? It's not easy!**

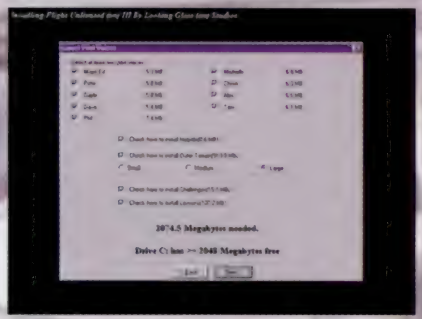
**FU II had many followers because this simulator never advertised the impossible. To many, FU II is a game—a fun game with advanced features. The disk space required was not a deterrent and the limited flight region was not an issue. Die-hard IFR devotees cannot understand why it had such success, and they wouldn't be caught dead with a copy of FU II, lest they want to endure verbal abuse from their peers.**

***Review by Phil Paschutine***

Many *Flight Unlimited* users I talked to were average Sunday flight simmers with no real knowledge of how to track a VOR or perform an ILS approach. All they wanted was to fly in a visual environment. Others were pilots wanting to release some frustration through aerobatics. They didn't want complicated panels, but all had a common need. They wanted to have fun. Some flight simmers take virtual flying too seriously and are so engrossed with nitpicking about little details that they forget all about the fun. (Some of them are borderline cases who never set foot aboard an aircraft and who make up for this by becoming "self-appointed experts" on flying). Some are preoccupied finding what the latest instrument gauge will or will not do in the other simulators, or sulking about the way such and such a feature is not up to standard. Others have got a copy of FU III and are happily flying in the photorealistic Seattle-Tacoma Metropolitan Area, departing from and landing at any of the eight controlled, 34 uncontrolled and eight maritime airports in Washington and five other western US states.

## Installation

FU III comes on three CDs. There are three installation options: minimal (263.8 MB), typical (710.3 MB) and full (2,074.5 MB). When installing FU III, you will be asked to choose up to nine Air Traffic Controller (ATC) voices and whether to install the online help files, outer terrain, challenges and lessons. At the end of installation, you will be asked if you wish to install the SF region from *Flight Unlimited II*. Any time after installation, you may reconfigure the voices. Changing any other of the above options requires that you first uninstall *Flight Unlimited III*.




***Flight Unlimited III* installation options**

## Manual and charts

There is an 11-page installation guide, a reference card with keyboard commands, and a keyboard-commands foldout for easy visual reference. Commands for the standard, Thrustmaster FCS, MS Sidewinder 3-D Pro and MS Sidewinder Precision Pro joysticks can be found on the reference card and on the foldout.

The 160-page manual describes the new aircraft—Stemme S10-VT Motorglider, Lake Renegade T-270 Seaplane, Mooney TLS Bravo and BeechJet 400A—including specifications, cockpit, operating limitations, how to fly and a checklist. Other sections deal with aircraft history, creating challenges and flying with ATC.

The manual only contains a brief two pages on navigation and navaids, with a glossary. I was unhappy (I dare not use the word "distressed") to find that no VFR chart of the Seattle-Tacoma (SEA-TAC) area was included in the box. It would have made sense to do so! So to compensate for this neglected item, it may be a wise idea to buy a sectional and a VFR terminal area chart. Or, if you have an Internet connection, point your browsers to http://www.flight3.com/approach.html and download the six approach plates for Renton Muni, Bremerton National, Tacoma Narrows, Boeing Field Int'l, Payne and Seattle Tacoma Int'l. Then go to http://www.flight3.com/airport.html and download the eight airport charts for Renton Muni, Bremerton National, Tacoma Narrows, Arlington Muni, Graaf AAF, Olympia, Payne and Boeing Field Int'l.

## The user interface

The main user interface is very similar to those found in games. I want to say that this is no reproach, as the aim of this simulator is to have the virtual pilot up and flying in seconds. So, complex menus are not necessary.

***The Flight Unlimited III user interface***

## Program options

Before doing anything else, you should set up your options. Available video resolutions are 640x480, 800x600 and 1,024x768. There are also other screens that show the other available options. Force feedback is supported.

***Follow the option screens to configure your system correctly.***

## Quick flight

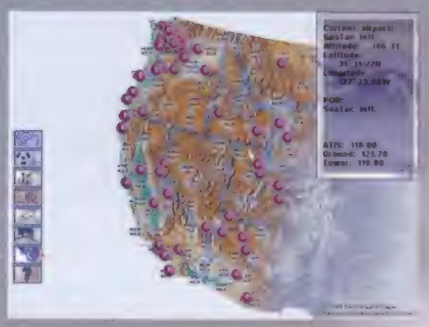
This is where you can choose another start location, if you do not want to use the default location. Choose an aircraft, create or load weather, then go fly. The current location screen will always default to the Sea-Tac International Airport area. The notepad (upper right) will display the name of the airport currently selected, Unicom, and any ATIS, ground or tower frequencies if available. Move your mouse cursor in the screen and as you go over them, see the airport names and point of interest displayed in the upper part of the notepad. Coordinates will match your current

mouse cursor location. The map goes from N48° 25", W124° 31" (top left) to N46° 36", W120° 46" (bottom right).

*Select your starting location and aircraft*

*Plan your flight on the multi-function map. Click on the icons and overlay airspace, VOR and points of interest on the map.*

You can, of course, position your aircraft anywhere in the western US by switching to the general map screen. However, you can only overlay VORs and points of interest. I wish someone had included the airspace overlay option on the general map screen.



*General map screen*

The general and Sea-Tac terminal maps can be zoomed in twice, but cannot scroll. If you want to zoom in elsewhere, you first have to zoom out with a right mouse click on the appropriate icon.

Click on any airport, and position your aircraft either at the ramp, on takeoff or on final approach. If you click anywhere else on the map or on any point of interest (see inset 3) you can position your aircraft at different altitudes (500, 1,000, 3,000, 5,000 or 10,000 ft AGL). You cannot change headings, and by default the aircraft will always be facing north. I regret that the icons do not have an information box appear when you pass the mouse cursor over one.

## Weather and clouds

Once your start location is set, go to the weather option. As you see in the screenshot, weather is customizable and the interface is quite simple to use. Unfortunately, there are no separate departure, enroute and arrival weather options.

*The weather dialog box*

You can change the time of day, seasons and phases of the moon, and adjust weather severity with the slider. You can even modify the winds aloft direction and front line. Here again you may need to zoom in twice.

Once done making your settings, hit the "Generate weather" button and, if all is satisfactory, accept the changes. If you do not want the changes, you can always hit the "Generate weather" button again for new weather. Name your custom weather and save the situation.

If you want to experience hostile weather conditions such as thunderstorms, snow, windshear, crosswind-shear, etc., then load one of the weather situations. I've flown in many types of weather and found that this virtual weather is good. Be very careful when loading a default weather situation, because it can be too severe if you fly the lighter single-engine aircraft. In this case you are almost assured to have a very unhappy ending, so if you want to stand a chance, stick with the jet.

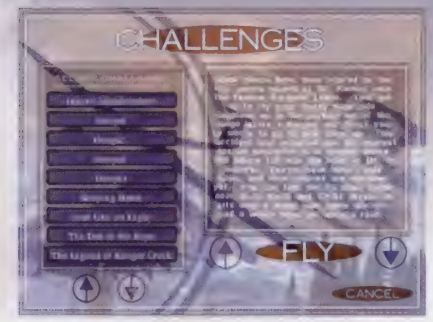
Some sort of TAF and METAR real-world weather possibilities is conspicuously missing. The clouds are well done, though not as well as in *Fly!* They look all right from far away, but are pretty unrealistic as you get closer. However, once you are in the pea soup, it's really pea soup. You can't see anything and need to rely on your instruments. Another thing about the weather is that it loops. Chances are, you will find the same weather after a one or two hours flight.

*Weather effects in* **Flight Unlimited III**

## Challenges

There are 11 challenges that, depending on your flying expertise, rate from "piece of cake" to "nearly impossible." You can fly a corporate shuttle one day and next day try the hoops courses through the mountains flying the P51D. You can get photographic proof of Sasquatch, fly the Renegade and intercept a Scraab speedboat, find injured hikers, etc. You can also create your own challenges. Some

challenges may prove too tough for you; you may need some help. The FU III readme file says, "If the challenges prove too difficult, there is an unsupported addition to the flt3.cfg file, show_challenge_marker, which will display a triangle over key trigger areas."




*The Challenges dialog box*

## Flight training

More interesting is the Flight Training option. It offers basic and advanced weather, as well as aircraft training. Choose a training section, select your lesson, read the instructions, then go practice or let the instructor demonstrate how it is done.

*Extensive flight training is available in* **Flight Unlimited III**

*Basic training* offers six lessons in taxi & takeoff, four fundamentals (climb, cruise, turn and descent) and instrument scanning. Instruction is also given in traffic patterns, standard rate turns and landing. It may be a good idea to see the standard rate turns before going on to the traffic pattern.

Additionally, there are interesting topics such as how losing static and electrical systems affect a particular instrument, or which gauge can't be used when the engine is out or not running.

*Advanced training* will teach you how to perform stalls, spins, steep turns, short field operations, engine failures, engine fires, night flying, VOR/ILS/NDB approach and landing.

*Weather training* involves crosswind landing, windshear avoidance, windshear flying, thunderstorms, thermals, mountain lifts and flying in ice.

*Aircraft training* teaches you how to handle the new FU III aircraft during all phases of a flight, from the moment you taxi right through landing. Keep in mind that this is not a full syllabus, but the contents are interesting and even if brief they are well explained. Unfortunately, the Mooney TLS Bravo has no taxiing instructions.

## Airport mode

This is your home base. Your selected airport and other data are to the left of the screen. Change weather settings, options and aircraft (and obtain information about many others, such as the Concorde, Warthog, 777). If you installed San Francisco, you will also be able to switch regions.

*The Airport dialog boxes*

## Flight Recorder and Flight Planner modes

The *flight recorder* enables you to record a flight and store it for later viewing or editing. The *flight planner* is a simple point and click interface to create and save or load a flight plan. The notepad will display your departure/destination points, turning points with distance from last point, ETA, heading, total run time and distance. Turning points can be deleted or moved. IFR virtual pilots will not find any reporting waypoints, much less airways. Then again, this is not an IFR simulator.

Load the BeechJet and the flight plan will already be there. Use the triangle buttons to cycle the waypoints. To zoom in and out you should use the plus '+' and minus '–' buttons, but these do not work and you will have to go through the whole sequence of 5…100 miles before getting the 5 NM range ring again.

# Examples of Flight Unlimited III Aircraft

**Fokker DR1 Triplane (left and below left)**

**Lake Renegade T-270 Turbo Seaplane (right and above right)**

**Stemme S10-VT motorglider**

*In un-powered flight I found this bird handled like an aircraft. Notice how the engine retracts and the dome closes. The Stemme has a 50:1 glide ratio, so you may need to go down with the spoilers on. A glider does glide very well! Be careful when taxiing, the wings are very long.*

**Cessna Trainer 172**

Piper Arrow (left and below left)

P-51D Mustang (right and aboveright)

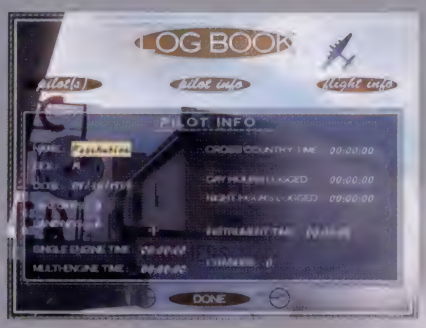
Mooney TLS Bravo (rightand far right)

Muskrat Seaplane (left and far left)

*Flight Recorder and Flight Planning dialog boxes*

## The logbook

This can include several users. You need to enter a few statistics and you can load the logbook at any time. You can choose a pilot and look at the flight statistics. The logbook will log flights according to their type (day, night, instrument only) and engine type (single, multi) and crashes (hopefully none). The logbook cannot be printed.




*The* **Flight Unlimited III** *logbook*

## Scenery and terrain

The scenery consists of photorealistically rendered 10,000 square miles of the Seattle area. This is the home of Boeing and Microsoft. This four-meter per pixel photorealistic scenery was built with satellite pictures applied to a digital elevation model (DEM). People who are familiar with the area will be able to pinpoint their favorite spots or even houses. When in map mode, press the G key to display a 1, 5, 10 or 25 miles grid on the Seattle map (flight planner and in-flight) and 10, 25, 50 or 100 miles grid on the general map. This is useful for approximating distances.

*High-resolution photorealistic scenery*

Depart from and land at any of the eight controlled, 34 uncontrolled and eight maritime airports. The big airports have photo-textured taxiways, and you must follow the taxiway lines. There are buildings, dynamic windsocks, taxiway signs, ground markings and lighted buildings at night.

You definitely need an airport chart to find your way around, especially when control asks you to taxi to a specific taxiway. If you do not have a chart or if you are in a hurry, press the Alt + F12 Cmd12 keys to display a guide line (taxiway path). However, there seems to be some problems with this, and it shifts to either side of the taxiway centerline.

*Use the taxiway lines as a guide*

The outer terrain represents a less detailed Western United States: Arizona, California, Nevada, Oregon, Utah and Washington. Note that although it is less detailed (no photorealistic textures), the outer terrain retains its real elevations. There are 62 additional airports that either exist as paved fields or have flat spots ready for airport construction. You can use the Flight Unlimited Editor (FLED) to add your own lakes, cities, etc.

Many *Flight Unlimited* users say they liked the colors better in FU II. Some have reported that FU III colors are on the green/gray side. Maybe this is due to their video cards; I have not experienced such problems. Night scenery is very well done.

When in cockpit view, press one joystick button and move the yoke right, left, forward and backwards to see outside views. In camera mode, you can use joystick buttons to pan the camera view or zoom in and out. Now if you have a joystick with eight buttons, you'll be able to change mixture and propeller pitch, trim, raise/lower the gear and change the point of view.

## The Flight Unlimited Editor (FLED)

Because of time constraints, this will be seen in another review. FLED allows the user to choose 3-D objects and set them wherever desired. You can drag and drop to create airports (runways, taxiways, lighting, runway lighting and buildings) and include various 3-D objects, such as windsocks and navaids. You can animate objects and include sounds as well.

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## Dynamic aircraft

*Flight Unlimited III* has plenty of dynamic (AI-controlled) aircraft. There's enough air and ground traffic to keep you very alert. For example, I was holding in front of a heavy iron when another rammed me from behind. Did I mention that I didn't call control and taxied on my own? If you come up close to another aircraft, you will even hear its engines.

## Aircraft

It always amazes me when I hear virtual pilots boasting about an autopilot flight in a Concorde from Paris to Deauville. Jeez fella, a Mooney will get you there! What fun is there in switching on the autopilot for such a short trip? Well, there are no heavies to fly in FU III, and the most complex aircraft you will get to fly is the BeechJet 400.

FU III includes 10 aircraft. The Cessna, Piper and P51-D were already in FU II. The Muskrat has an instrument panel that looks like the one the Beaver had in FU II, and the Windhawk is very similar to the Baron. The flight models are good except for the Cessna 172, which reaches its rotation speed pretty fast. My personal favorites were the seaplanes and the Stemme. Apart from *SFS3.0* and *Hang Sim*, I have not found any other worthy gliders in a simulator. The idea to include a motorglider in FUIII was a slick one. Peruse the Stemme's checklist, and once you're confident that you can transit from powered flight to non-powered flight and vice-versa without damaging the engine (it will happen if you get your sequences wrong), you will experience some very nice flights. This is also the occasion to familiarize yourself with mountain flying.

Engine startup is accomplished by pressing the E key. To change the heading bug or to rotate the card, you will have to use the mouse in a circular movement. This is a bit confusing at first!

When in your own aircraft, you can use a "Beam me up" option to go to the aircraft in front of you (this works with objects as well).

## Flying with ATC

*Flight Unlimited III* features interactive air traffic control. It's interactive in the sense that you press the spacebar and choose preset phrases to acknowledge the controller or to make a request. The manual goes through the basics of air traffic control. It explains how one should act at controlled and uncontrolled airports. It describes each controller and their job in assisting the pilot (clearance delivery, ground, tower and RADAR approach). Center controllers were left out, so expect no ATC while enroute. You will learn how to operate at uncontrolled airports (position reports) and how to interact with Unicom when entering the traffic pattern (identify your direction of entry, request an airport advisory, deliver your initial position report upon entering the pattern, etc.). You will also deal with operating at a controlled airport and how to use the various services (ATIS, clearance, ground, tower and hand-off to RADAR services).

Several scenarios for departure and arrivals will teach you how to interact with the tower control, clearance delivery and ground control. All this, of course, is basic but it's enough for beginner pilots.

I wish to point out that not many seasoned virtual pilots worry about using ATC services; they just taxi to any runway (regardless of wind condition) and take off. The good thing about ATC in FU III is that if you even attempt to taxi without going through the proper ATC sequences, you are going to get chewed out! Try taxiing anywhere else but on the taxiways and ATC will tell you that, although they appreciate you "mowing the lawn," they wish you would stick to taxiways only.

Airline calls are pretty funny, so don't start laughing when you hear ATC calling Ignited, Aeroflop, Air Plastique, Peerless or Paradox airline. There is a key you can use to see the airlines' name tags. This is pretty useful when flying, as aircraft are often only tiny specks on the windshield.

The RADAR control will follow you, help you find your way if you are lost and vector you on request. The Unicom frequency is preset when you start at an uncontrolled airport, and at controlled airports you can cycle all the frequencies for that airport by pressing Alt + F.

## FU II compatibility

You can use the *Flight Unlimited II* scenery for the San Francisco region with version III. During installation you will be asked if you wish to install this area. **Warning:** Some people having the French version of FU II reported that they could not install San Francisco to FU III. It seems the files are different. FU III will not recognize bundled or OEM versions of FU II. You need the full retail version that comes in two CDs.

### System Requirements

The following lists the system requirements for using *Flight Unlimited III* (according to Looking Glass):

- Pentium II 350 minimum
- 64 MB RAM recommended
- CD-ROM drive using 32-bit windows 95/98 CD-ROM drivers
- 2.1 GB disk space
- 3-D graphics accelerator using the 3SDfx Voodoo 3, Banshee or Voodoo 2 chipset Minimum 4MB video card with DirectDraw driver
- Dx 6.1-compatible sound card with DirectSound support

### For More Information

Flight Unlimited III

Looking Glass Studios, Inc.
100 Cambridge Park Drive, Suite 300
Cambridge, MA 02140

Web site: http://www.lglass.com

Suggested retail price: US$39.99

## Command console

Originally used for debugging, this feature was kept in the final release version. When you press the colon ':' key, a console will appear in which you can type commands to make your plane transparent, tilt the front view up or down, set object density or re-map joystick buttons or keyboard keys (this can also be done by creating a joykeys.cfg file). You can dump all existing *joykey* bindings to a file. There are over 160 default *joykey* bindings.

## Things needing improvement

Although FU III is a very enjoyable simulator, it is not without faults or "wish they had done this" missing features.

### *Aircraft*

Some virtual pilots may regret not being able to switch planes on the fly.

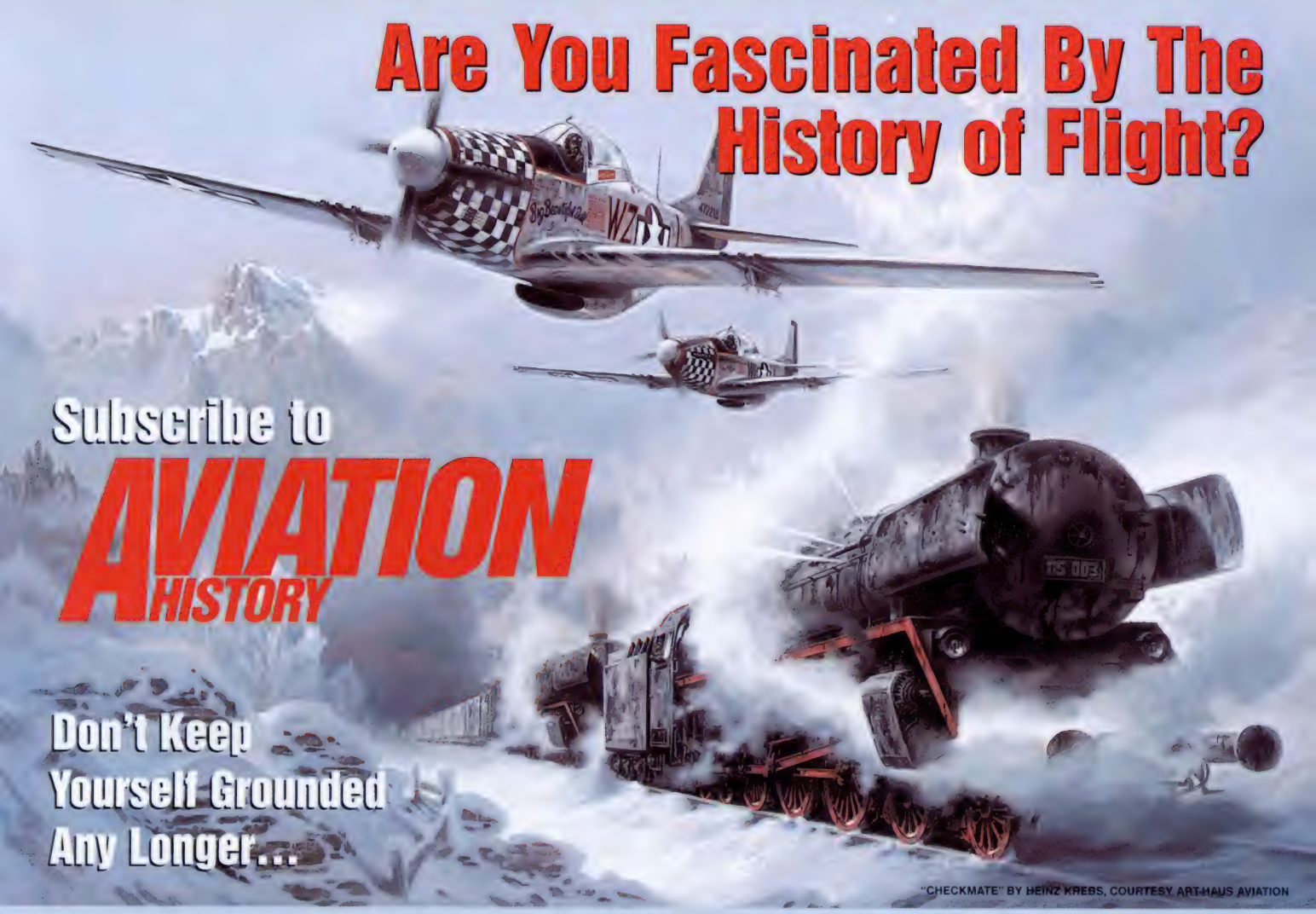
### *Visual guidelines*

Taxiway path guidelines seem to shift.

### *Collisions and ATC*

Planes get embedded into scenery objects, and aircraft ram you from behind. I deliberately rammed a building and requested taxi information, which I received. FU III does not seem to recognize a collision. On another occasion, I taxied and took off, then ground instructed me to use taxiway "B."

# Are You Fascinated By The History of Flight?



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*Things occasionally collide in FU III*

When declaring an emergency, the controller will vector you to the nearest airport, then make you do small course changes and eventually you'll overshoot. The controller will still ask you to do course changes, even as you land.

I requested vectors for an ILS to Sea-Tac, I followed ATC instructions then intentionally didn't pick up the ILS, and ATC asked me to redo the approach. So far, so good. Then I acknowledged that and declared an emergency. The controller kept telling me to expect vectors for another ILS approach, but by that time I was safely on the ground and wandering around inside the FBO.

You may experience some inability to send messages when another controller is talking to some other pilot. Clearance requests are only valid in the region you are flying (SF or Seattle), and there are no clearances when flying in the outer terrain area.

### *Charts*

The problem here is that there are no charts. FU III is VFR oriented, and charts would have made sense. Trying to locate taxiway "B" at Sea-Tac is next to impossible if you do not have the airport chart.

IFR fans may feel left out because there are no waypoints or airways. But let's face it, you cannot have waypoints/airways in just the Seattle-Tacoma area.

### *System memory*

There seems to be a memory leakage problem, where RAM is not freed after you quit FU III. I started with 91% available, and I launched FU III twice, then closed it. This brought my free memory to 48%.

**About the author.....**

**Phil has always been interested in planes (As a kid, spent many hours at the Westchester County Airport in White Plains N.Y. drooling at the planes) He is a devoted flight simmer since FS 4 and an IFR nut, with some glider experience.**

## Conclusion

*Flight Unlimited III* is resolutely a VFR simulator, and virtual pilots will no doubt experience many hours of fun. Its photorealistically textured scenery is awesome, one of the best to date. The wide variety of aircraft will please general aviation enthusiasts. But of course, it does not offer the ability to add third-party aircraft, like Microsoft FS 2000. The flight training tutorials, the challenges, the user-friendly interface, the simple flight planner and weather generator will have you up and flying in no time. Although not without fault, the ATC is a good learning aid.

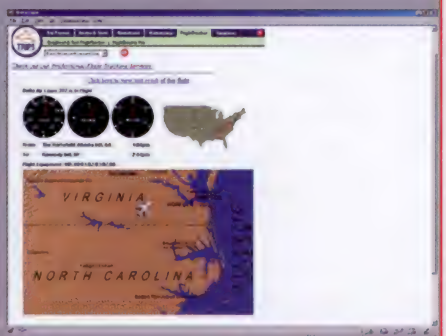
## Finding/Tracking Flights on the Internet

Have you ever wanted to track a flight across the U.S.? Several websites will help you track flights. You won't even need to know the flight number or airline. One example is called The Trip (www.thetrip.com). Use this web site to find out the current status of any flights between major cities within the United States.

This site is unique because it's currently the only Internet-based, real-time flight tracking tool of its kind. Two versions are available (Professional and General Public). The General Public version is free but features:

- Query by airline & flight number
- Query by city & time
- Query by random flight
- 2-hour tracking window

For example, the following is the tracking for Delta Airlines Flight 392 between Atlanta and New York on November 15:




As you can see, you can find specific information such as aircraft type, altitude, speed and more.

Using the Internet to track a flight isn't only useful if you're waiting for friends or relatives, but it can be fun too!

*(Information suggested by William Slaughter)*

# The Fly! Scenery Editor: A First Look

## By Basil Copeland

The long term success of TRI's *Fly!* flight simulator depends, at least in part, on the development of add-on scenery for users. While the five major scenery areas in *Fly!* are nicely done, the generic scenery covering the rest of the world often bears little resemblance to reality. Recognizing the importance of stimulating the development of add-on scenery, TRI committed to release a free scenery editor as soon as possible after shipping *Fly!* While release of the scenery editor took a little longer than expected, it has now been out for a couple months, and add-on sceneries are starting to appear. In this article I provide an overview of the features of the editor and a more detailed look at the basics of creating scenery for *Fly!*

### Features

The *Fly! Scenery Editor* is an integrated development tool capable of performing most of the tasks associated with creating scenery for *Fly!* These include:

- Satellite imagery import tool
- Digital Elevation Model (DEM) import tool
- Scenery model placement tool
- File Manager (manages .epd files)
- Shape, Part and Articulation Editors (for 3-D models and aircraft articulation)
- BSP Editor (for managing large, complex models, such as bridges)
- Taxiway Editor (for creation/editing of taxiways)
- Database Editor (for creation/editing of airport, runway, navaid, ILS and other databases)

The editor is essentially the same in-house development tool that TRI used to develop *Fly!* It underwent some minimal "cleaning up" before it was released to the public, but not a lot. This shows, in that error trapping is primitive to non-existent, and the editor is prone to crashing. But the circumstances under which it is prone to crash are predictable and can be avoided or worked around. Before releasing the editor, TRI informally polled *Fly!* users on the AVSIM Fly! forum to determine whether they wanted the editor released as soon as possible "as is," or whether they would rather wait for TRI to produce a more polished product.

The consensus was almost unanimously in favor of the editor being released as soon as possible, even though it would not be a polished product. So that is what we got. Though released as "unsupported," this only means that it is not supported through the same kind of formal G.o.D. (Gathering of Developers, *Fly!*'s distributor) technical support process provided for *Fly!* itself. *Fly!*'s Project Leader, Richard Harvey, has provided substantial informal support to users on the AVSIM Fly! Scenery Design forum. With his help and the growing shared knowledge of individual users, the *Fly!* editor is proving capable of doing most of what scenery designers could reasonably expect of it. It still has some unresolved issues, which I will mention later.

But *Fly!* scenery add-ons are now appearing with some regularity, and this would not have been possible without the release of the editor. Best of all, the editor can be downloaded free. It has already undergone a couple of patches, and we can expect at least one more to deal with the unresolved issues discussed below.

## A Quick Tour of the Editor

Figure 1 is an image of the screen that greets users when they first load the *Fly! Scenery Editor.* (Actually, users first see a license that they have to agree to each time the editor is loaded. Figure 1 shows what users see after they agree to the license document and the editor has completed loading.) The main window displays a WYSIWYG ("what you see is what you get") view of the scenery as you would see it in *Fly!* Unless you change the coordinates in an on-disk editor.sit file, the editor always starts centered over San Francisco International, as shown in Figure 1. With the main window active, you can slew around with the keyboard arrow keys. As you slew, the white rectangular outline seen in Figure 1 moves. The white lines outline a "general tile," or texture bitmap. We'll describe the *Fly!* tile structure in more detail later. The windows to the right provide further information on the tiles in view, and the window at the bottom of the screen provides information on 3-D models (objects) and an interface for placing and moving 3-D models.

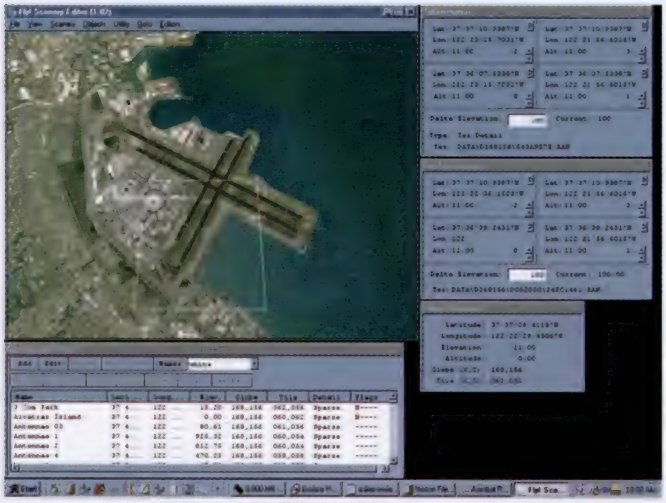


*Figure 1*

While the WYSIWYG view isn't quite the same as slewing around within *Fly!* itself, it is close. Using the same keyboard slew controls as for *Fly!* itself, one can zoom in and rotate the image in 3-D, allowing for oblique views of the scenery like that shown in Figure 2.

*Figure 2*

Most features of the editor can be accessed through pull-down menus in the main window's menu bar. These include importing targa bitmaps for creating textures based on satellite images, importing elevations from digital elevation models (DEMs), working with individual generic tiles (called "stamping" tiles in *Fly!*), placement of specific kinds of scenery objects (windsocks, beacons and static aircraft models), and several utility functions (flattening airports, matching up elevations along tiles, and cleaning up tile edges when tiles of different resolutions are joined together). Plus, the **Editors** menu provides access to the *Fly!* File Manager and a variety of specialized editors (such as the Taxiway Editor; the Shape, Part and Articulation Editors; and the Database Editor).

Learning to use the *Fly!* File Manager is one of the first steps toward learning how to create scenery for *Fly!* Individual scenery files, such as textures and text files used to control how scenery is displayed, are combined into *.epd files—"pods." The File Manager, illustrated in Figure 3, provides a DOS-like interface for managing pods. The most commonly used options will be extracting files from existing pods, and creating new pods to hold user-created scenery.

While user-created scenery is initially created unpodded, i.e., as individual files on the hard drive, they need to be podded for optimum efficiency once the scenery is finished. Fly! is much more efficient building its scenery database from pods than from individual files on disk. There are so many files created during scenery design that loading them from disk individually causes long pauses—up to 30 seconds or more—during an actual *Fly!* session. Using the *Fly!* File Manager to pod the scenery eliminates these long pauses. The pods also eliminate wasted disk space associated with fixed cluster sizes for what would otherwise be hundreds (or more) of individual files.

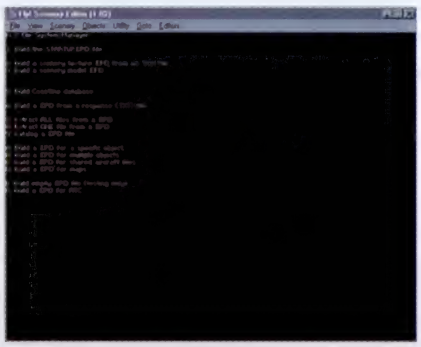


*Figure 3*

In the remainder of this article, we will look more closely at a few of the most typical tasks involved in creating *Fly!* scenery, such as importing satellite images and digital elevation models, working with and understanding the *Fly!* tile structure, and 3-D model placement using existing models. Some of the more specialized tasks, such as taxiway creation and creating and importing new 3-D models, are best left to future articles where they can be treated in greater detail.

## *Importing Satellite Images and Digital Elevation Models*

*Fly!* was designed around the use of satellite imagery for creating detailed scenery areas. One can use the editor to work with generic tiles in *Fly!*, but the power of the *Fly!* editor is most evident in the ease of use when importing satellite images. Understand, though, that "ease of use" is used here relatively. First time users will usually stumble over some "gotchas" along the way, but once they get the process down, importing and creating textures from satellite imagery is relatively straight-foward.

Let's look at the *Fly!* tile structure. *Fly!* is designed around three different kinds of "tiles:" global tiles, general tiles and detail tiles. The basic unit of scenery creation is the "global tile." A global tile is roughly 64nm square, narrowing as one moves away from the equator and toward the poles. Each global tile is divided into a 64x64 matrix of "general" tiles (4,096 in all), consisting of a 128x128-pixel texture (16 KB). Each general tile can be broken down further into detail tiles for enhanced resolution. With general tiles using 128 pixels to represent approximately one nautical mile (nm), the basic resolution in *Fly!* is approximately 14 meters per pixel. While this is adequate, perhaps, for rural or undeveloped terrain,

designers typically want greater resolution for airports and urban scenery. That is where detail tiles come in. Detail tiles are simply general tiles broken down further into a pattern of 2x2 or 4x4 tiles in sizes of 128x128 pixels or 256x256 pixels. A general tile broken down into 4x4 tiles of 256x256 pixels yields a 1,024x1,024-pixel image. While this allows for excellent resolution—under two meters per pixel—it results in one megabyte of textures to cover a single square mile and also requires satellite imagery capable of yielding that kind of resolution. In comparison, eight meters satellite imagery would be wasted on detailed tiles of this resolution. For eight-meter satellite imagery, 2x2 detail tiles of 128x128 pixels each is adequate, and only requires 64 KB of textures. If one wants greater resolution, and has the satellite imagery to support it, the *Fly!* editor is rather flexible and capable in what it will allow.

The initial importing of satellite images and digital elevation models is done with the **Create Entire Scenery Area** command of the *Fly!* editor's **Scenery** menu. When you click on the "Create Entire Scenery Area" option, a dialog box pops up, illustrated in Figure 4 (on the right). This dialog box defaults to the global tile coordinates under the "eye" of the editor (the white rectangular box). As long as you are anywhere within the correct global tile (remember, it covers an area roughly 64nm square, and represents 4,096 general tiles), *Fly!* will correctly parse your "import text file."

An "import text file" looks something like this:

```
========== TGA Filename ==========
tka.tga
———— lower left lat lon ——
62.28N
150.20W
———— upper right lat lon ——
62.38N
150.00W
========== DEM Filename ==========
talkeetna-e.ras
———— DEM X,Y samples ————
601,1201
———— lower left lat lon ——
62.0000000N
151.0000000W
———— upper right lat lon ——
63.0000000N
150.0000000W
========== END OF FILE ==========
```

This text file tells the editor the names of the files to use to create textures and elevations and the geographic coordinates covered by the files. As is obvious from the dialog box in Figure 4, you can choose to import textures, elevations or both.

For importing or creating textures, *Fly!* can work with any 24 -bit color targa bitmap. It doesn't have to be a satellite image. Since no satellite image for the Mt. McKinley area of Alaska was available, I created a largely hand-drawn and textured bitmap for the targa file for my scenery of Mt. McKinley and Talkeetna. I did have an overhead aerial photo of Talkeetna that I used for a photoreal depiction of Talkeetna. For Anchorage, I am using bitmaps composed of both overhead aerial photos and colorized satellite imagery. *Fly!* doesn't care how the import bitmap was created. It only needs to know the name of the bitmap and the upper right and lower left geographic coordinates of the image. Once everything is entered into the Create Entire Scenery Area dialog box, the editor takes over and starts creating textures. The status is reported on screen with a message like "Slicing tile 2,346 out of 4,096." Where it starts or stops in this process depends on how much of the global tile is covered by your bitmap. Slicing the textures for a whole global tile can take anywhere from one and a half to three hours. When the process is done, upwards of 65 MB of textures (or more, if detailed tiles are involved) and associated text files (which tell *Fly!* how to load the textures) are automatically created and ready for *Fly!* For smaller areas of coverage, the amount of textures involved will be correspondingly less. The texture creation process is all automatic and transparent to the user once the import text file is properly created and loaded into the editor.

Creating more detailed and accurate digital terrain is almost as simple and can be done at the same time the textures are created, or this can be done independently. But, there is another step involved: creating the .ras file from a supported digital elevation model. The *.ras format is a special *Fly!* format for elevation data. While there is widely available public digital elevation data, especially for the U.S., this data has to be converted to the *.ras format before it can be imported into *Fly!* This proved to be problematic at first, and it took several weeks and the determined effort of several individuals to work the kinks out of how to convert USGS one degree DEMs to *Fly!*'s *.ras format. With Version 1.02 of the *Fly! Scenery Editor*, a converter is now provided for converting the USGS one-degree DEMs to *Fly!*'s *.ras format. A couple of excellent freeware converters are also available. Once the necessary *.ras file has been created, it can be used to import detailed digital elevation data into *Fly!* This process is much quicker than the creation of textures, taking only a few minutes at most.

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## Showing what the Scenery Editor can do

I've used the *Fly! Scenery Editor* to create new scenery for a portion of the Alaska Range around Mt. McKinley, including the town of Talkeetna, and I am in the process of creating satellite-based scenery for Anchorage, Alaska. Figures 5 and 6 present a couple "before and after" screenshots showing what the scenery looked like before I created new scenery with the *Fly! Scenery Editor*, and what it looked like after. Figure 5 is a screenshot taken along the foothills of the Alaska Range near the mouth of Kahiltna Glacier. The left view is what the scenery looked like before I created new scenery with the *Fly! Scenery Editor*. Pretty drab, right? The right-hand view is what the scenery looks like now, thanks to the *Fly! Scenery Editor*. Two differences clearly stand out: more realistic terrain and new textures. In the new scenery, I've imported elevations from USGS one degree DEMs (digital elevation models) and created new textures that are mapped to the local topography.

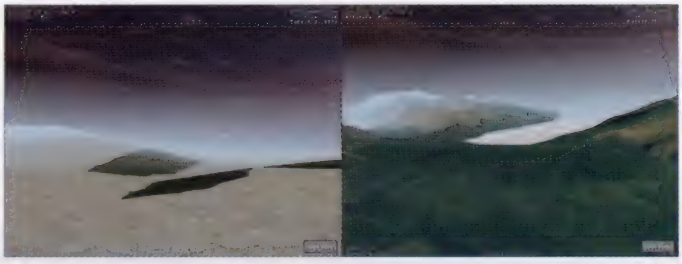

*Figure 5*

Most of the hard work in creating scenery like this does not involve the editor itself. It involves creating the targa bitmap that is "sliced" by the editor into textures. Figure 6 provides another example, this one a "before and after" screenshot of the scenery I'm creating for Anchorage, Alaska. Again, the left-hand view is what the default scenery looks like: three runways dropped into the middle of scenery based on generic tiles. The right-hand view shows what the scenery looks like after creating textures based on satellite imagery and an aerial photo of Anchorage International. Again, the hard work was in creating the import bitmap. The satellite imagery I worked from was black and white and had to be colorized to yield

the scenery shown in Figure 6. One aspect of working with satellite imagery in *Fly!* that can be tedious is getting the image to line up properly with existing airport and runway placements.

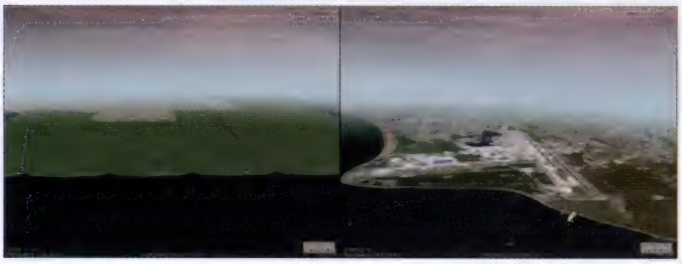

*Figure 6*

## 3-D Model Placement

The *Fly! Scenery Editor* can be used to place 3-D models in new or existing scenery. These can be new models created using third-party tools and imported or converted for use in *Fly!*, or they can be any of the 3-D models used in the default scenery. In the latter case, they must be extracted from their "pods" using the *Fly!* File Manager. But existing hangars, buildings, bridges—any of the 3-D models or structures you see in the default scenery—can be placed in your own scenery using the scenery editor. One can even place static 3-D models of the default aircraft in scenery, though this is a little more complicated. There are also some default articulated models—windsocks and a beacon—that can be placed in new or existing scenery.

3-D models are placed in new or existing scenery in two different ways. The most common way will involve working with the Scenery Object Options window that always appears at the bottom of the screen when you load the editor. This window lists all the models found by the editor within the current working global tile and provides options for adding new models or working with existing model placement. When you click on "Add" in the Scenery Object Options window, a standard Windows 98 dialog box opens to your *Fly!* Models directory—illustrated in Figure 7—and you simply select the model you want to add to your scenery. Using numeric keypad keys, you can move and/or rotate the object to place it where you want it in your scenery. The other method of placing 3-D objects is used for articulated models, such as beacons, windsocks and static aircraft models. These objects are placed through a dialog box accessed from the **Objects** | **Place Scenery Object** menu command.

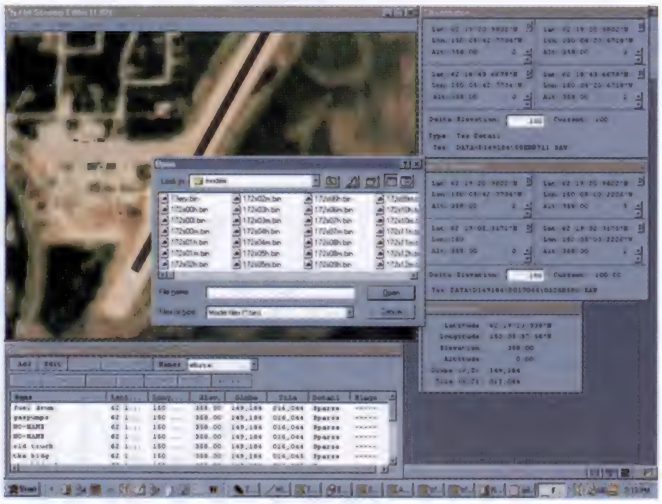

*Figure 7*

Figures 8, 9 and 10 illustrate some simple model placement that I did for my Talkeetna, Alaska scenery. Figure 8 is an oblique view of the scenery from within the editor, showing the buildings and runway superimposed on imported textures created from an aerial photograph of the town and airport. Figure 9 is a close-up of some of the structures at the airport itself and some buildings in the background representing downtown Talkeetna, Alaska. The buildings I used to represent downtown Talkeetna, as well as the pickup truck and trailer at the airport, are actually *Monster Truck Madness* models that are compatible with *Fly!* Figure 10 is view of the beacon I placed at Talkeetna. This is *not* the default beacon object, which is rather ugly. This beacon object was created at my request by Andrew Furnaby, who used *3-D Studio Max* to create the original object, and then I used a freeware utility called *Binedit* to further modify it. While the default 3-D objects in *Fly!* are often rather ugly, that is not a limitation of *Fly!* itself. Presumably, any model created in *3-D Studio Max* or in a program capable of producing objects in .3ds format can be imported into *Fly!* and then placed in your scenery with the editor.

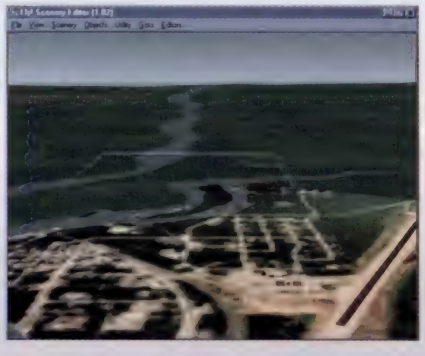

*Figure 8*

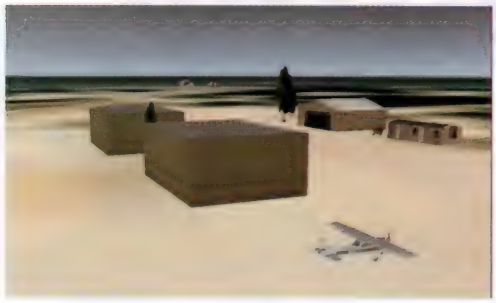

*Figure 9*

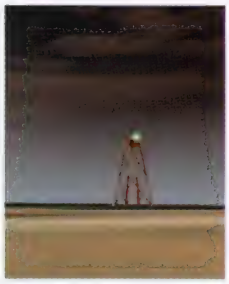

*Figure 10*

## Limitations and Unresolved Issues

We've really only hit the highlights of scenery creation with the *Fly! Scenery Editor*. Some tasks, such as importing 3-D models, working with articulated models and working with the taxiway editor, are too complex to treat in any detail in a single article such as this. I hope, though, that the reader will now have some idea of the capabilities of the *Fly! Scenery Editor*. There isn't much it cannot do. After all, it is the tool that TRI used to create the scenery we see in *Fly!* Still, the editor is far from perfect. Besides learning to work with the poor to non-existent error trapping, there are a couple of major unresolved issues that need to be addressed by TRI before the editor can be used to do everything users will want to do with it. One of these unresolved issues is the "prime meridian problem." The current procedures for importing and creating photoreal or satellite textures does not work when a global tile spans the prime meridian. This has seriously hampered the development of scenery for Great Britain and France. So far as I know, there is no known "work around" for this problem. But I know that TRI is aware of the problem, and I'm sure they are trying to fix it.

The second major unresolved issue involves the problem of database edits. I haven't said much in this article about creating new airports or any of the tasks associated with creating runways, approach lighting, etc. All these kinds of tasks are done with the Database Editor. I've used the Database Editor for some elementary tasks such as adding PCL (pilot controlled lighting) and FSS (Flight Service Station) frequencies to an existing airport. Working with the Database Editor is not particularly difficult. The problem is that the editor works with and modifies the *default* databases, it does not create distributable extensions to the databases. What this means is that if I create a new airport or update an existing airport (like I did for Talkeetna by adding PCL and FSS), there is no way to distribute this new scenery without distributing a modified default database. As much as I like *Fly!* and respect all the hard work that has gone into it, somebody failed to think through what would be required for users to distribute new add-on scenery that involves modified databases. Even if I did create a new airport and distributed it by distributing the modified database, my new airport wouldn't be in the database of any other add-on scenery. The next scenery designer who designs a new airport would have to do what I did—modify the default database and distribute that modified database. End users would then be forced to choose one or the other.

Given the way TRI designed its data structures for *Fly!*, the only solution I can see to this problem is for TRI to produce a utility that incrementally modifies the default databases. I know they're working on something along these lines. Until we see this utility, we're unlikely to see many, if any, new airports for *Fly!* We have seen and will continue to see new satellite scenery for improving the quality of the generic scenery around existing airports and in topographically attractive locations like the Grand Canyon or the Alaska Range. These kinds of scenery projects do not require working with the databases. Given that *Fly!* is a completely new product and lacks the years of user add-on development associated with Microsoft's *Flight Simulator*, I think *Fly!* has come a long way in a very short time in stimulating the development of add-on scenery by releasing the scenery editor. But TRI's task is not done and I'm sure TRI knows it. We'll see a new version of the editor that addresses these problems before long.

**About the author.....**

**When not tinkering with his computer or the latest flight sim, Basil Copeland is an economist and "expert witness" on behalf of municipalities and public agencies in utility rate cases.**

**Married 32 years to his lovely wife Kris, he has two grown sons and a daughter who wants her own computer. Basil enjoys both commercial aviation simulators, like MSFS and Fly!, and military combat simulations like Falcon 4.0. He's the author of the *Alaska 98* freeware scenery addon for FS98, and is now working on Alaskan enhancements for TRI's Fly!. Basil resides in Maumelle, Arkansas.**

# Understanding Airspace

## By Jim Rhoads

On the surface (literally), airspace is a vast and beautiful sky that seems endless. Now enter the word *aviation*. Aviation airspace is still vast and beautiful, but now you have get out your measuring stick. It reminds me of the song in which Mick Jagger sang, "Hey you... get off of my cloud!" If only he would have known how true that statement really is.

Flying in your favorite flight simulator allows you to take off from virtually anywhere in the world and do as you like—departing or entering a pattern from any direction, busting airspaces, punching holes in the clouds, whatever you please. You can do that in real life as well, but be prepared to face consequences both from officials and Murphy's law.

The airspace system is a measure of safety, protection and organization. Can you imagine driving your car anywhere and everywhere, tearing off the defined public highways, through cornfields and woods, then busting back out from nowhere back onto the road? (Hmmm, does sound like a few people I know.) Believe it or not, there really are people that fly this way, never speaking to anyone, defining their own set of rules and probably becoming NTSB (National Transportation Safety Board) statistics in a given amount of time. So for those of us who want to fly to a ripe old age, or at least keep our licenses and make our simulation experience more realistic, we need to understand how airspaces work.

## Airspace Classifications

What types of airspaces exist, and what are their requirements? I'm glad you asked. The different classes of airspace mean different things whether you are rated as a VFR (Visual Flight Rules) or an IFR (Instrument Flight Rules) pilot, and what kind of airspace you are in. We will look at some basics that are involved in recognizing the types.

### Uncontrolled airspace, or Class G

All airspace from the surface up to 700 ft MSL (Mean Sea Level) or 1,200 ft AGL (Above Ground Level) that *does not* belong to either Class A, B, C, D or E, is considered uncontrolled. This includes airports without control towers. This also includes towered airports that periodically close the tower for certain time periods. During this period that the tower is closed, the airport is considered uncontrolled. These airports can be classified into two different categories: Unicom or Multicom.

### Unicom

Look at illustration 1 and notice that the airport Wabash (IWH) has a magenta box surrounding some important information. It also has other information available to help you understand what kind of airport it is and what to expect there. The information in the box denotes the following:

"796" is the airport elevation based on Mean Sea Level. Of course, on the ground we know that we are zero feet AGL. But while on the ground and sitting in the aircraft, we will set the altimeter to read 796 ft. To the right of that, you will notice an "L." This tells us that the airport has runway lighting. If you were paying attention, you maybe wondering why the "L" has an asterisk '*' preceding it. This tells us that although the airport has runway lighting, some lighting limitations

### *Illustration 1 (left) and Illustration 2 (bottom)*

exist, and we should refer to an airport directory to find what they are. In this case, Wabash airport has 24-hour lighting that is pilot controlled.

To the right of the "L," you will see a number "44." These numbers are always rounded off to the nearest hundred and denote the longest runway. "44" in this case tells us that Wabash's longest available runway is 4,400 ft. long.

Moving to the right of the "44," we see the numbers "122.8." This tells us that Wabash has a common traffic frequency of 122.8. This is the frequency that we will be using to communicate to all other aircraft within the immediate area and to announce any intentions within the given airspace or on the ground.

Since this is considered a Unicom airport and I have just explained the recognition and the responsibilities of the pilot, I will now explain the duties of the Unicom operator, which is typically the FBO (Fixed Base Operator). The Unicom operator provides basic information, such as the wind direction and wind velocity as well as the active runway or other airport conditions. Obtaining this information is actually the pilot's responsibility. The Unicom Operator is considered a field advisor and is not responsible for controlling traffic. Typical Unicom frequencies are 122.7, 122.8 or 123.0.

## Multicom

Look at Greensburg-Decatur airport in Illustration 2. Decatur is considered a Multicom airport. The illustration still has the elevation, lighting, runway and frequency information. So what makes this airport different and considered Multicom? Because Multicom airports do not have air-to-ground communication. All communication is done between aircraft, requiring the pilot to be particularly on his toes. Monitoring the area approximately 10-15 miles prior to entering the airport area is advised, and so is declaring any intentions and/or position reports while transitioning below 3,000 feet. All Multicom airports use 122.9 for radio frequency transmissions.

## Class E airspace

Class E airspace includes non-towered airports or Class D area airports with part time towers (which become Class E when the tower is closed). Transition areas are from terminal to en-route and airways from 1,200 ft AGL on up to 18,000 ft MSL.

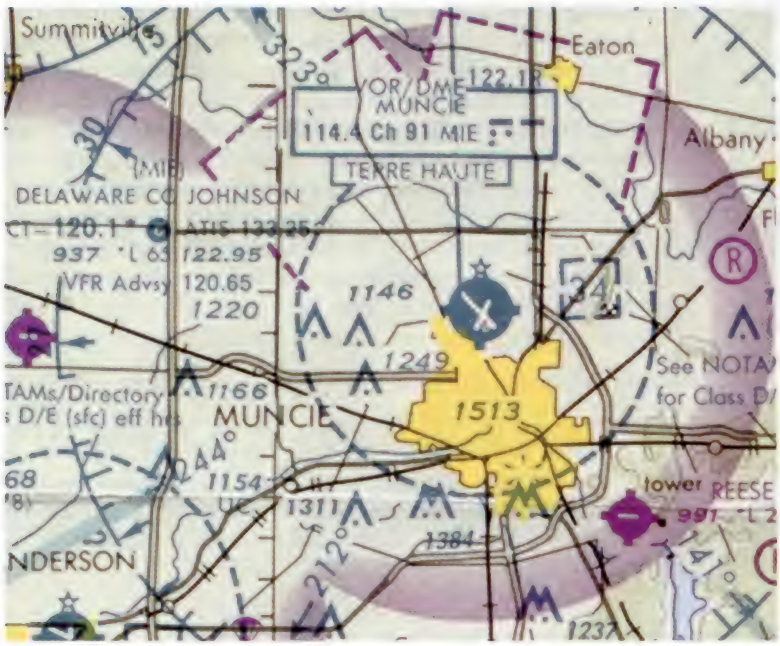


*Illustration 3 (above) and Illustration 4 (below)*

Transition areas were implemented to protect approaching IFR pilots from encountering VFR pilots flying under the weather. Typical Class E is from 700 ft to 1,200 ft AGL. Surface-based Class E VFR minimums are 1,000 ft ceiling with three statute miles visibility. If an airport is in or surrounded by Class E airspace, weather observer or automatic weather observation equipment must be available. If weather information is not available, the airspace becomes Class G, with a Class E transition area.

Look at Illustration 3. Freeman airport shows a perfect example of the transition area into a Class E airspace.

## Class D airspace

There are some control towers out there that, although they do handle a fair amount of traffic, they are not busy enough to receive a Class C status. On your sectional chart, a blue dashed circle around the airport denotes Class D airspace. You will also notice that the airport is displayed in blue and not magenta like our non-towered airports (see Illustration 4). Blue always denotes a towered airport. Unlike the non-towered airports, it is advised that you use radio communication 15-20 miles prior to entering the airspace, and this is mandatory while within the dashed blue line, which is considered the airport traffic area.

A few things are different when entering a controlled airspace with a tower. First, you should monitor the ATIS (Automated Terminal Information Service) frequency prior to establishing radio communications with the tower. ATIS will give you the current weather and airport information, such as:

- Active runway
- Winds
- Visibility
- Sky conditions
- Altimeter setting
- NOTAMS (Notice To Airman).

This information gives you a keener sense of the immediate conditions and expectations of the airport. It helps keep transmissions to a minimum and allows the controller to do his job.

ATIS recordings are periodically changed to reflect current conditions and are phonetically coded. You remember the phonetic alphabet, right? (Alpha, Bravo, Charlie, Delta, etc.) The process goes kind of like this: Advise the controller on initial contact you have

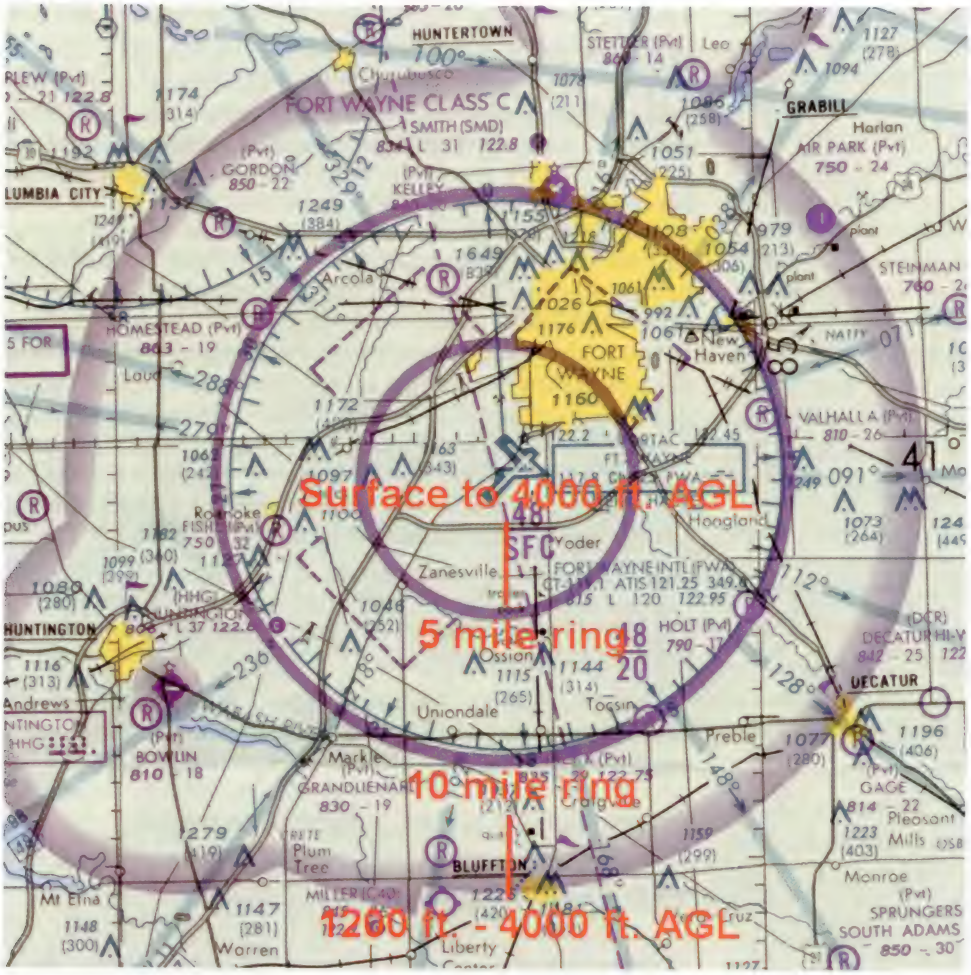


*Illustration 5 (above)*

information Alpha (or whatever the current phonetic code is at the time). This lets the controller know that you have a good idea what is going on around the airport and are complying with the proper steps involved in entering their airspace. Now that you are in a controlled airspace, you have a little more responsibility.

On the ground, you will now be given taxi instructions, be required to communicate with ground once you have departed (or when you have landed), and quite possibly will have to contact clearance delivery before taxing for departures.

Clearance delivery provides the facility with your basic departure information, such as your destination, requested altitude, heading, type, etc., and requires a read back of all instructions issued from the controller. Clearance Delivery allows controllers to realize your intentions and helps assist them in planning traffic flow.

Class D airspace can be visually interpreted as a cylinder that extends from the center of the airport to a five-mile radius, and extends up to 2,500 ft AGL. Typically, most Class D airports are not equipped with RADAR. Some Class D airports may have a BRITE (Bright Radar Tower Equipment) if they are adjacent to or overlapping a Class C facility. The Class C will relay the RADAR images to the "D" facility through a microwave link, thus allowing the "D" facility to issue advisories to all transponder, "Mode C" equipped aircraft.

Other restrictions also apply to Class D airspace:

- Do not exceed 200 knots within four nautical miles and below 2,500 ft AGL of the primary Class D airspace.
- No aerobatics, ultralights or unmanned free balloons unless prior approval has been granted.

## Class C airspace

While writing this article, I stopped by the local airport and met a couple pilots in a Shrike Commander. After introducing ourselves and lying about our ratings, how many hours we had in type and stuff, we discussed what we did occupationally. I explained to them that I had to get back and finish an article I was writing for *Full Throttle* about understanding airspace. After receiving a look like they just ate a raw lemon, one said, "So, are you managing the ability to stay awake while writing it?"

The truth is, most of us find that, although it is necessary to understand and memorize all the requirements, minimums, recognition of the different types, floors, and adjacent classes etc., it is quite monotonous and probably one of the lesser enjoyments of flying.

Class C is probably one of my favorites because it keeps you busy enough to work you, but not crazy enough to get you in trouble. Class C is RADAR controlled and can be identified on the sectional by magenta rings that start from the center, from ground level. Class C extends up to 4,000 ft. AGL. It is important to think of the airspace as an upside down wedding cake to get the visual picture. See the Illustrated Airspace class, provided by AOPA for this article.

The first ring that extends five miles from the center also includes airspace from the ground on up to the 4,000 ft. The second ring, which starts at the five-mile point and extends out to 10 miles, has a floor that starts at 1,200 ft and extends

up to the 4,000-ft ceiling. As you can see in Illustration 5, this does vary but is considered typical. The third outer ring extends to 20 miles and is not typically shown on charts. Radio communication is not mandatory, but is advised within this ring.

Your plane must be equipped with a "Mode C" transponder or you cannot enter Class C airspace. The correct transponder transmission is required. So if you don't have the proper transponder, you can't come in! It's as simple as that. Contact must be initiated and acknowledged prior to entering the 10-mile ring. If you are not cleared to enter the airspace, then you must avoid it. You can't assume that they will get with you shortly. The truth is, they probably will, in the form of a possible write-up.

Class C requires that you will be in contact with the following facilities when departing or arriving at the class airport:

- Atis
- Approach
- Tower
- Ground
- Clearance Delivery
- Departure
- Restroom (OK, I threw that one in, but count on it)

Speed is restricted to 200 knots below 2,500 feet AGL within four nautical miles of the primary airport. Aerobatics, ultralights, unmanned free balloons and parachute jumps are prohibited unless prior permission is granted by ATC (which is unlikely).

## Class B Airspace

You are going to have to be brave to enter Class Bravo airspace. Well, not really, but things are much busier here and less tolerance is accepted. It is easy to understand why. You can expect lots of jetliners and business jets here. And of course, you will find general aviation aircraft as well, but I have always had the feeling that the controllers do not particularly cherish them. Why? We are just not fast enough. Lots of schedules and sequencing is going on in Class B airspace. It's kind of like when you have just enough time to make it to that important meeting, and you are making great time, and then boom!—Grandma Myrtle pulls out in her 1962 Valiant, and there is no way to pass. She's just in the way and costing you time.

I can remember flying up to the outer ring of Chicago ORD airspace and making my initial call in to tell the controller that I was transitioning his area. The controller instructed me to remain clear of Class B airspace. I radioed in and advised him that I would be flying below the outer ring and asked if that was acceptable. His response was: "I don't care what you do, just remain clear of class B airspace!" OK, I got the point.

Big or small, if you are going to play in Class B airspace, you have to know what it is all about. Thick blue lines on the sectional chart can distinguish Class B. This again is reminiscent of an upside down wedding cake, in that from the core, it has rings from five to 15 nautical miles typically, and the highest layers may extend 20-30 nautical miles. Of course, the ceilings may vary, but most commonly are around 8,000 feet MSL.

The same rules apply to Class B as in Class C, but you can expect to move to a few more frequencies, with more vectors and altitude changes to accommodate the flow of traffic and expected arrivals and departures. Class B allows positive control of both VFR and IFR traffic. Since the RADAR coverage is larger, Class B is able to provide separation to all aircraft and requires mandatory communication.

A transponder with "Mode C" is required within 30 nautical miles of the primary airspace, up to 10,000 ft MSL. This is called the *Mode C Veil*, which also exists outside the normal boundaries of Class B.

The speed limit is 250 knots within Class B airspace. VFR corridors impose a 200-knot limit (see the chart in this article). Again, no aerobatics, ultralights, unmanned balloons or parachutes above 2,000 feet AGL. And in some instances, no student pilots are allowed without pre-approval.

## VFR transition routes

These routes are used to assist VFR flights in certain areas of Class B airspace, helping to trim controller workload. These routes may or may not be available depending on traffic.

## Terminal area VFR routes

When trying to avoid Class B, C or D, these routes accomplish just that, while operating in the complexity of terminal airspace. Some include recommended altitudes and visual references.

## VFR Flyways

VFR flyways allow the pilot a transition route under Class B airspace. No clearance is needed, but communication must be established with any other overlying or adjacent airspace. Care should be taken to be on the lookout for other VFR traffic within the same route area.

### VFR Corridors

These are holes in Class B airspace, with specific horizontal and vertical boundaries, that pilots may transition the airspace without clearance or communication with the controlling agency. Pilots must use extreme caution in these areas because of other VFR congestion.

## Class A airspace

If you are a VFR-rated pilot and are in Class A airspace, that probably is not one of the better choices you have made recently. Why? Because Class A is reserved exclusively for IFR pilots at or above 18,000 ft MSL and extending up to 60,000 ft MSL, or within the altitude more affectionately referred to as "Flight Level 600." Class A includes the airspace over all of the 48 contiguous states and also includes Alaska. IFR clearances are required. Aerobatics are prohibited, as are ultralights and parachutes unless pre-approved by ATC.

I don't know about you, but I am afraid I would need a change of clothes if I spotted an ultralight at or above 18,000 ft. Nevertheless, if you ever do consider trying it, remember to ask permission (grin).

## What's left?

Well, I am glad you asked again. Just when you thought you understood it all, here we have what are referred to as *Special Use Airspaces*.

### Prohibited areas

These areas are designated as prohibited either for security or national welfare reasons. These are designated with a letter "P" followed by a number, and you darn well better have permission before entering one. Have you always wanted to fly formation with an F-16? Fly into P-56 in Washington D.C., and not only will you be able to do just that, but they will greet you with a welcoming party when you land. Be sure and have your phone card with you.

### Restricted Areas

OK, so the F-16s and welcoming committee aren't exactly what you thought they would be, but you still want to fly with those fighters and see what they can do, huh? Well, then restricted airspace might just be what you are after. Designated with an "R" and a following number, here you will not only be able to see those F-16s again, but will be able to see some of their armament in action. The problem is you will probably need both a bulletproof vest and a lot of luck. Also, you are *still* going to need permission, which is not going to happen unless you are on fire. Look at it this way, if you make it through this one, you still get a welcoming party when you land. All kidding aside, *do not venture into one of these unless pre-approved*!

### Warning areas

Warning areas extend three miles beyond shorelines over international waters. The FAA has no authority over these areas. They were basically set up to warn pilots that hazardous activity might be associated here, with no FAA jurisdiction.

### MOAs

Military Operation Areas are setup to separate military traffic from commercial and general aviation traffic. Typically, these are high-speed training areas. MOAs are distinguished with the letters MOA preceded by the Operation Area's name.

### Alert Areas

Alert areas are where unusual aerial activity or dense pilot training is likely to occur. Alert areas are designated on the sectional chart with a letter "A" followed by a number.

### MTRs

There are two types of Military Training Routes: IR (IFR) and VR (VFR). These usually contain military traffic that is on one-way high-speed routes below 10,000 ft. Pilots should make contact with the nearest Flight Service facility within 100 miles of an MTR to determine whether it is "Hot" (active) and for advisories that pertain.

Understanding airspace regulations and how they apply to you is an important part of flying an aircraft. But the truth of the matter is that when you fly IFR, airspace seems to disappear. Does it really? No, because you are now under the controller's thumb and he controls your application to his airspace.

What does this all have to do with flight simulation? If you are one of those who want their flights to mimic just as it is in real life, it's important that you understand what is expected.

If you want to add a bit of challenge, break out a sectional chart and try to fly your approach or departure within the designated speeds and regulations that apply to the airspace. Obviously, not everything can be covered in this article, but much more information is available, even at your own local airport or through

| | | |
|---|---|---|
| Class A | Above 18,000 Feet Altitude: Approval (IFR Clearance) | N/A |
| Class B | Biggest and Busiest Boundary (ATC Clearances) | Solid Blue Line |
| Class C | Communication within 20 miles (with approach) | Solid Magenta Line |
| Class D | Dialogue (with tower) | Dashed Blue Line |
| Class E | Everywhere Else | Dashed Magenta Line or Vignette |
| Class F | Forget it (not in U.S.) | N/A |
| Class G | Government Free | Blue/Magenta Vignette |

| Airspace Features | Class A Airspace | Class B Airspace | Class C Airspace | Class D Airspace | Class E Airspace | Class G Airspace |
|---|---|---|---|---|---|---|
| Operations Permitted | IFR | IFR & VFR | IFR & VFR | IFR & VFR | IFR & VFR | IFR & VFR |
| Entry Prerequisites | ATC Clearance | ATC Clearance | IFR Clearance VFR Radio Contact | IFR Clearance VFR Radio Contact | IFR Clearance And Radio Contact | None |
| Minimum Pilot Qualification | Instrument Rating | Private Cert. Student Cert. * | Student Cert. | Student Cert. | Student Cert. | Student Cert. |
| Two-way Radio Comm. | Yes | Yes | Yes | Yes | IFR Only | No |
| VFR Min. Visibility below 10,000 MSL | N/A | 3 Statute Miles | 3 Statute Miles | 3 Statute Miles | 3 Statute Miles | Day 1 Statute Mile Night 3 Statute Miles |
| VFR Min. Visibility 10,000 MSL and above | N/A | 3 Statute Miles | 3 Statute Miles | 3 Statute Miles | 5 Statute Miles | 5 Statute Miles |
| VFR Minimum Distance from Clouds below 10,000 MSL | N/A | Clear of Clouds | 500 below 1,000 above 2000 Horiz. | 500 below 1,000 above 2000 Horiz. | 500 below 1,000 above 2000 Horiz. | 500 below 1,000 above 2000 Horiz.** |
| VFR Minimum Distance from Clouds 10,000 MSL and above | N/A | Clear of Clouds | 1,000 below 1,000 above 1 Statute Mile Horiz. | 1,000 below 1,000 above 1 Statute Mile Horiz. | 1,000 below 1,000 above 1 Statute Mile Horiz. | 1,000 below 1,000 above 1 Statute Mile Horiz. |
| Aircraft Separation | All | All | IFR Special VFR and Runway Operat. | IFR Special VFR and Runway Operat. | IFR Special VFR | None |
| Traffic Advisories | N/A | N/A | Yes | Workload Permits | Workload Permits | Workload Permits |

* Student pilot Operations at some Class B airports are prohibited
** Day – 1,200 AGL and below – Clear of Clouds

sources like AOPA's Air Safety Foundation.

With the advent of organizations like SATCO (Simulated Air Traffic Controllers) and programs like *Roger Wilco* with real-time voice interactivity, many people are performing real aviation procedures as well if not better than many of us in the real world. Understanding airspace just makes it that much more realistic.

So the real question is, "Do all the real-world pilots fully understand all the intricacies and elements of the entire airspace system?"

Of course we do. Well, actually the truth is probably not. Most of the time the controlling agencies are keeping us abreast of where they want us and alert us if something doesn't look quite right. What I have outlined are really the most applicable scenarios of airspace that are typically encountered. But when charting into unfamiliar territory, it is always prudent to do your homework and get a full understanding of your given route and destination, just as if you would never be talking to anyone.

So the next time you walk in the backyard and gaze up into the vast endless sky, chances are somebody owns it!

**Very special thanks to Bruce Landsberg and the AOPA Air Safety Foundation for pictures and reference information supplied for this article.**

**About the author.....**

**Jim Rhoads is the senior writer at *Full Throttle*. He's also a real world pilot and the proud owner of a Piper Cherokee 140. Jim has been an avid flight simulator enthusiast for over 10 years – since the days of FS 4. He resides in Wabash, Indiana, where he can watch the corn grow between airborn excursions.**

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# Round Robin Adventure

## Baja Peninsula to Mazatlan, Mexico

This Round Robin takes place in the beautiful resort areas of La Paz on the Baja Peninsula, to Cabo San Lucas, across to Mazatlan, Puerto Vallarta and then back again to La Paz. It is a lengthy trip, but you can take one route at a time.

This is one of my favorite places in the world. My wife and I vacation often in Puerto Vallarta. We cannot say enough about the friendliness of the Mexican people. We're awed by their genuine courtesy, happiness and love for life every time we go. We always return home with only one thought in our minds—to go back soon.

For those who are new to this, Round Robins are published so flight-simmers can explore new scenery, refresh knowledge of geography, practice cross country navigation, fly approaches at different airports all over the world, and have some FUN.

In the Round Robin, you will get information like airport departure and runway number, VOR and ADF frequencies and two or three middle airport destinations. We will use both Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) approaches. Then we will return to the point of departure to complete the Round Robin.

You will also be given ILS and LOM frequencies (RRs always use real-world navigation data), visibility minimums, procedures, etc. Information on the scenery needed to complete the flight, who created the scenery (for non-commercial) and where to get it will also be supplied.

After you fly a few of these, you will have a much better command and understanding of the different types of published procedures. You will learn to handle a lot of information in a very short time, while still maintaining control of your aircraft.

I also suggest that you read the entire route a couple times before starting, so that you'll have the flight plan clear in your mind.

Round Robins use "real" world navigation. This one is flown using Microsoft default Flight Simulator 2000 scenery. FS 2000 has all the necessary airports and navaids. If you wish to fly this RR with FS98, you will need to download and install the freeware scenery packages BAJA-A.ZIP, MEXNAV.ZIP and VALLARTA.ZIP. Locations on the Internet for these files can be found below.

Round Robin 10 can also be flown with any other flight simulation programs that have the required navaids and airports. I flew a Boeing 737 on this trip, which is best suited for a mid- to large-size passenger jet.


**About the author.....**

**Al Pelletier was born in Matane, Quebec in 1948. He served 25 years as aircrew in the Canadian Air Force, in a non-pilot role. His job centered around Radar, Forward Looking Infra Red (FLIR), and radio communications. He has over 6000 hours of flying in everything from Canadair Argus, Tracker, Sea-King Helicopter, DC-3's, and P-3's.**

**Al retired from the Air Force in 1990 as Warrant Officer and is now the owner of a small town Computer Retail store. His hobbies included Flight-Sim (Of course), fishing and gardening. He is presently taking flying lessons towards his private license.**

**By Al Pelletier**

CoPilot - [ftrr010fp.fp]

File Edit View Navigation Window Help

| Waypoint | ID<br>Freq | Elev | Position | To Next Waypoint<br>Course | <br>Distance | <br>Comments |
|---|---|---|---|---|---|---|
| LA PAZ INTL | LAP<br>118.10 | 72 | N 24° 04.4'<br>W110° 21.8' | 147T<br>137M | 65.3 nm | |
| SAN JOSE' DEL CABO INTL | SJD<br>118.90 | 361 | N 23° 09.3'<br>W109° 43.5' | 089T<br>079M | 190.9 nm<br>65.3 nm | |
| Gen Rafael Buelna Intl | MMMZ<br>127.70 | 33 | N 23° 09.7'<br>W106° 15.9' | 143T<br>133M | 131.1 nm<br>256.2 nm | |
| Tepic<br>VOR | TNY<br>113.90 | 3150 | N 21° 25.3'<br>W104° 50.2' | 208T<br>199M | 50.3 nm<br>387.2 nm | |
| PUERTO VALLARTA ON RWY 4 | <br>118.50 | 20 | N 20° 40.8'<br>W105° 15.2' | 302T<br>293M | 289.2 nm<br>437.5 nm | |
| SAN JOSE' DEL CABO<br>VOR | SJD<br>114.00 | 361 | N 23° 09.0'<br>W109° 43.0' | 328T<br>318M | 66.3 nm<br>726.7 nm | |
| LA PAZ INTL<br>VOR | LAP<br>112.30 | 72 | N 24° 05.1'<br>W110° 21.5' | 200T<br>189M | 0.8 nm<br>793.0 nm | |
| LA PAZ INTL | LAP<br>118.10 | 72 | N 24° 04.4'<br>W110° 21.8' | | <br>793.8 nm | |

*A look at the geography (left) and the Flight Plan for Round Robin 10 (below left).*

## Route for this Round Robin Adventure

**La Paz: General Manuel Marquez de Leon Airport**

*to*

**Cabo San Lucas: Los Cabos International Airport**

*to*

**Mazatlan: General Rafael Buelna International Airport**

*to*

**Puerto Vallarta: Licenciado Gustavo Diaz Ordaz International Airport**

*to*

**La Paz: General Manuel Marquez de Leon Airport**

### First Leg

From: La Paz

To: Cabo San Lucas

Distance: 66 nautical miles (nm)

- In the FS 2000 **World** | **Go To Airports** menu, select "Mexico," "City of La Paz," "Gen Manuel Marquez de Leon airport."
- Dial in the Cabo San Lucas VOR (SJD), frequency 114.00 MHz, on your NAV2 radio, and the La Paz (LAP) VOR, frequency 112.30 MHz, on NAV 1. Set your NAV 1 course selector to 138 degrees.

*FS 2000 Boeing 737 at La Paz General Manuel Marquez de Leon Airport.*

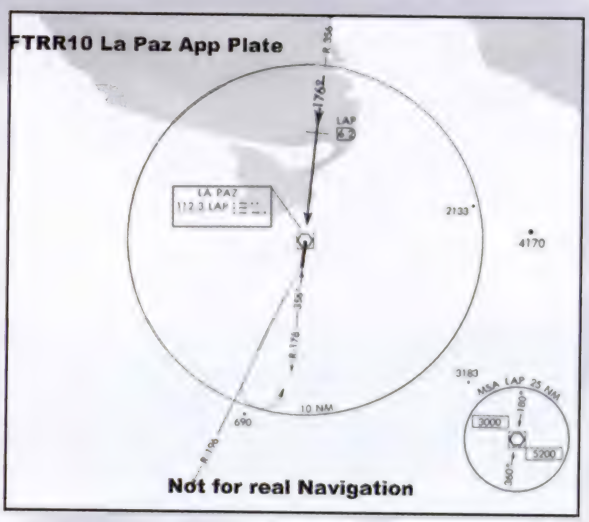
## Fourth Leg

From: Puerto Vallarta

To: La Paz

Distance: 350 nautical miles (nm)

- Set your clock to 16:00.
- Dial in the PVR VOR frequency of 116.60 MHz on your NAV 1 radio, and set your course selector to 293 degrees. You can also set the Cabo San Lucas (SJD) VOR at frequency 114.00 MHz on NAV 2.
- Taxi to and takeoff from runway 04, making a left climbing turn to 21,000 feet, and establish the 293-degree radial of PVR. (In FS2000, reception of the Cabo VOR is about 182 miles out. Not so lucky in FS98!)
- Track the SJD VOR to on top upon reception.
- Over the Cabo San Lucas VOR (SJD), dial in and track the La Paz (LAP) VOR on 112.30 MHz on your NAV 1 radio at approximately 318 degrees, and begin your descent to 10,000 feet. You can also dial in the La Paz NDB at 300 Hz on your ADF radio.
- Set your course 177 degrees in preparation for a VOR/DM approach to runway 18 (actual course: 177 degrees, elevation: 69 feet, and runway length: 8,200 feet).
- At 40 nm out, continue your descent to 5,200 feet and continue tracking the VOR.
- When you are 10 nm out, descend to 3,000 feet and overfly the VOR on a HDG of 030 and reduce to approach speed. Continue for 6 miles (this takes you over the water), then turn left and descend to 2,200 feet. Continue and carry out the approach with your NAV 1 course lock, with a normal rate of descent (approximately 700 ft per min for this approach).
- Continue with the approach. You are cleared for a landing to runway 18. Check that your gear is down and land at La Paz.




*Approach plate for La Paz - General Manuel Marquez de Leon Airport.*

# Welcome home!

### Scenery Requirements

***FS 2000 users:***
Default scenery. No need to add anything!

***FS98 and FS6 users:***
Microsoft default and the files MEXNAV.ZIP, VALLARTA.ZIP, BAJA-A1.ZIP with the necessary texture files associated with most scenery. All are available at: ftp://wings.ark.com/pub/fullthrottle/RoundRobins/ftrr010 or at http://mars.ark.com/~apeltier/fullthrottle/

You'll also find extra maps, approach plates and more for this article that you can download at ftp://wings.ark.com/pub/fullthrottle/RoundRobins/ftrr010

***Many thanks to Chris Squire for test flying the route. Chris is a retired military pilot with over 12,000 hours of flying.***

***Visit Al Pelletier and his crew at apeltier@mars.ark.com http://wings.ark.com***

# Homebuilders' Corner

## This issue: Moving Parts

By David Lewis

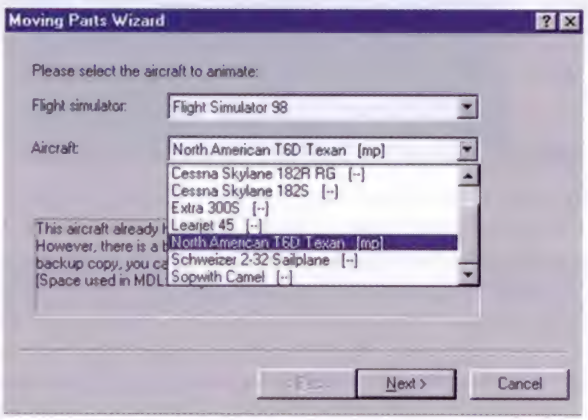
This time I would like to look at adding moving parts and landing lights to your finished aircraft design. Now that the right tools are available for the job, it adds a real touch of class to the aircraft.

For this example, we will use the Abacus *Aircraft Animator* package to animate the T6 Texan that ships with *Flight Shop*. You can download a trial version of the software from Abacus' Website at www.abacuspub.com. The trial version is fully operable, but it only lets you fly the modified aircraft around Chicago's Meigs airport. At least one other program is due for release soon that will offer the same capabilities.

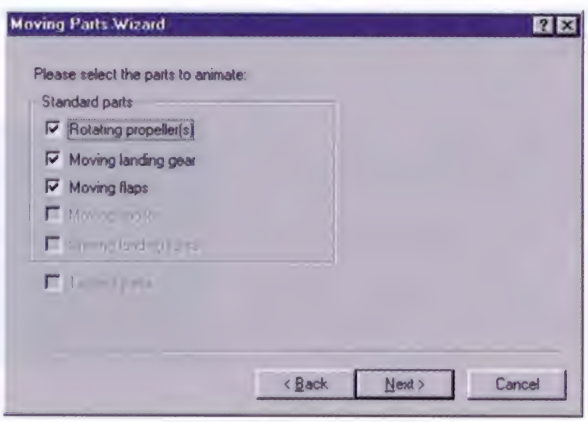
### Getting started

Install the *Aircraft Animator* by running the self-unzipping .exe file. The only question you will have to answer is where to put the files. Next, start *Flight Shop* or *Aircraft Factory 99* and produce the Texan. Use the FS98 converter to convert it to FS98 format.

Now run the *Aircraft Animator*. You will be guided to choose either FS98 or *Combat Flight Simulator* aircraft, and the animator creates a list of all aircraft available for you to animate. Choose the Texan from the list.




The *Aircraft Animator* examines the model and decides which movements it can automatically assign. In this case there are three: retracting gear, spinning prop and smooth flaps.



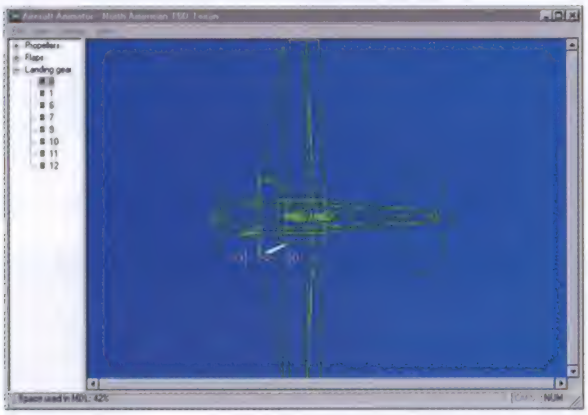

**About the author.....**

**David Lewis is a senior IT specialist with IBM. His fascination with aircraft started with model kits as a boy, and he has been creating aircraft for Microsoft Flight Simulator since FS4. He has released many virtual planes, both freeware and commercially, and other utility programs for flight-sim users. David is 36 years old and lives in Portsmouth, England.**

Choose to "Save the aircraft and exit Aircraft Animator." The first three features have now been added. Start FS98 and look at your improved aircraft.

The spinning propeller and smooth flaps work just fine. The gear is also correct for this model, and the animator has correctly guessed that it retracts inward. Let's look at how we'd change it to retract outward, though.

Restart *Aircraft Animator*, select the Texan, and this time choose to "proceed with manual editing." You should see a top view of the Texan with a tree display down the left margin, a bit like Windows Explorer. Click on the plus sign '+' beside "Landing gear" to open the detail of the gear parts.



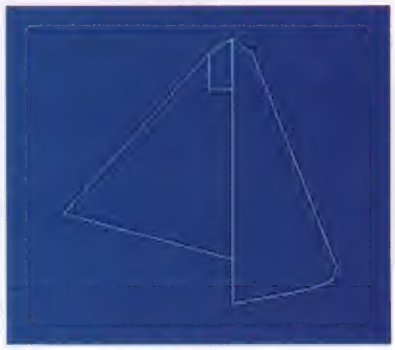
This view shows a part highlighted (it's the left main gear strut), with the hinge-line marked. That's the line along which the gear hinges. You can change this by dragging the three handles to a new position. However, there's a more accurate answer for simply reversing the direction: right-click on the label "# 0", and select **Reverse Axis** from the pop-up menu. Notice that you have to do this for each part of the landing gear, four on each side of the aircraft. Then select **File | Save**, and inspect the result in *Flight Simulator*.

## Adding control surfaces

The next thing to do is to add a moving rudder. The first step is to cut the tail in two, one part of which will be the rudder and the other will be the fixed part of the tail. This is complicated on the Texan by the fact that the tail is already in two parts (vstabt and vstabb).

What I did was to re-model vstabt by removing the three points behind –11.8 aft, and add that section instead to vstabb.

This introduces a number of lessons. First, the new part vstabb is no good, because that little step forward makes it concave. In the simulator, that part of the rudder flickers in and out of view. So, I reworked it to remove that piece. Second, the top of the rudder should have a similar step forward, and making this would require a second rudder part. Here's the finished view.



The extra piece at the front of the rudder I called *vstabt1*, and fitted it into the assembly list as number 16 in the part number sequence for the tail, with exactly the same art settings as the other vstab parts. Ironically, although the fixed tail is now a concave part, I don't get any flicker problems with it. If you do, you'll just have to cut it into two as well.

Finally, set the two rudder parts to only appear when the airspeed is below 198 knots. This is a flag to the animator to indicate that those parts are actually a moving rudder.

Start the animator again. Notice that a pair of "Rudders" has appeared in the list at the left margin. Switch to a side view to see them properly. You'll notice that they both rotate the same way and both about the leading edge. That's not right, since the front part should rotate about its trailing edge.

Right-click the main rudder, and look at its properties. The "Y" value (-5.42969) is the position of the leading edge. Now do the same for the front part, and set the "Y" value to the same number. Click **File | Save**, and examine your handiwork.

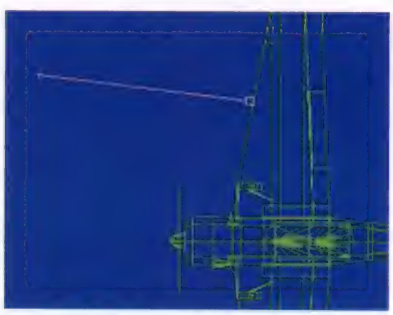
The other control surfaces just use the same techniques. The elevators are another concave surface to be cut out of the current part—in place of the line that exists at the moment. The ailerons need to be cut out of the trailing wing parts. Get those done, and you'll be able to sit in the cockpit, look around, and check "full and free movement of all controls," just like a real pilot.

## Landing lights

The original Texan model has no landing lights, which makes operation at night rather challenging. Let's add a single beam at the right wing root.

First, create a roughly circular part at the front of the wing. Next, add it to the assembly in the wing, mid, right group. I didn't use any sequence number for this one. Tag it as a landing light by setting it to only appear with the gear down. According to the documentation, it should also be possible to set the display condition to "speed below 193," but I can't get this to work. Also remember to set the color of the part to [L] White for a brightly-lit effect.

Then, produce and convert for FS98 again, and start the animator. Two new parts appear: the landing light (the bright disc on the wing) and a landing light beam. Select the light beam, and drag the two ends around to position it on the aircraft, and position the direction of the beam on the ground. Finally, right-click the part number and select the properties to adjust the spot width and length on the ground. It's as easy as that.



## Clear glass

The other thing that I thought would look really cool on this model is some transparent glass. This is very easy to achieve with the *Aircraft Animator*. Simply go into the part editor and create some new parts (called *glass1*, etc.) around the front of the cockpit, using the existing window frames as a guide. Then, create a component out of them, called *glassc*. Finally, add that component to Body, main, with no sequence number. Give it a color of light blue and a display condition of "speed below 180."

As usual, produce the aircraft, convert for FS98, and go into the animator. This time simply open the aircraft with the wizard, and save it. The glass will be made transparent.

This was a pretty rough-and-ready technique. If you've more time to spend on the glass, you can add each pane to the assembly separately (rather than as a component) and use insignia controls to make sure that they are only visible from outside. Then you won't be looking at the world through blue-tinted glasses. Have fun with a model of your own, and see how much better it can be made to look.

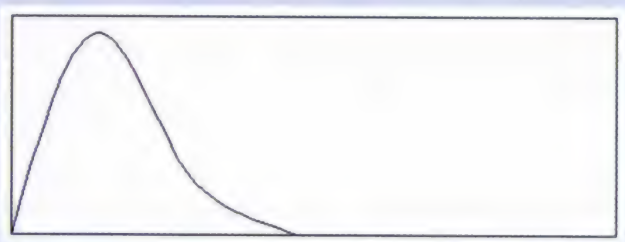
If you're looking for a source of inspiration, there are some great .afx files available to download from the AFX Warehouse (www.crisscross.com/users/mitaka/project/afx.html) and at Freeflight Design (www.geocities.com/~freefltdesign).

### Problem planes #9 – Quarterly textures

I've had some requests to explain how to paint two unconnected parts with a single .pcx file. This is a useful trick, since the number of .pcx files is limited to ten per aircraft. It works best with approximately square areas, both painted from the same direction (e.g., tail & wheels, both from the side).

You should create a .pcx file in quarters. One part (say the tail) goes at top left and bottom right (as seen from the right and left sides, respectively), and the other at top right and bottom left.

To set the art options, first apply the texture to all parts of the tail. Then set art options for one of them to "all objects sharing PCX." Write down the four numbers that are calculated. Now remove the texture from all tail parts, apply it to the wheels, and note the art options in the same way.



*The aim is to create an effect like this, where we tell* Flight Shop *that the area we want the texture to cover is the rectangle, but the only parts in that area that actually use the texture are on the tail.*

So, subtract the aft limit from the fore limit for the tail's art options, giving the length of the tail. Now add that number to the fore limit, giving a new fore limit at the front of the rectangle in the diagram. Do the same for the wheels, but instead of adding the difference to the fore limit, subtract it from the aft limit.

Finally, go back and set the art options on all tail and wheel parts, using the limits you noted down and the new ones you calculated. Both parts should now paint correctly with a single .pcx file.

# How I Make Scenery

## Photoreal Textures III: Refining Techniques, from Image to Textures: Using USGS Sample Images

### By Justin Tyme

In the previous issue we described a method for using real digital orthophoto images (DOQQs) to create textures suitable for applying to ASD2 terrain grids. While the major advantage to using these images is the four corner crop marks that make georeferencing easy and precise, there are also disadvantages. The actual DOQQs are 40 MB each and cover only 3.75 minutes square. If you are lucky, you may find some available for free download from your local state university Geography department's FTP server (if you don't mind downloading 40 MB image files), but you will more than likely have to purchase them directly from the USGS at $7.50 each on CD-ROM. The cost of these can quickly become prohibitive. So, using the actual DOQ images is probably not practical for most designers, especially for freeware hobbyists.

Fortunately, there is an alternative that is both comprehensive and free. The USGS offers reduced-resolution sample images online at http://edcwww.cr.usgs.gov/nsdi/doq_qq/ph1crit.htm. Coverage of the contiguous United States is nearly complete and the currently available files can be found at http://mcmcweb.er.usgs.gov/status/doq_stat.html. The USGS updates this list often, so if your area isn't covered yet, check back frequently to check for new images.

As with the actual DOQQs, using the sample images has advantages and disadvantages. The advantages are their price (free) and their size (reasonable). The USGS sample images available online can offer results as good as using actual DOQQs, although the method is slightly more convoluted with a higher chance for inaccuracy.

Although the sample images can make good textures, their reduced resolution makes the little crop marks disappear. Since proper and precise cropping is an essential element of georeferencing the images, and due to the overlap built into each DOQQ, this accurate cropping becomes very problematic. This creates a real hassle when trying to match the edges of the adjoining textures.

Say you are covering an area 30 minutes square. This is eight rows and eight columns of DOQQs, or 256 different edges to match up if you tried to crop them individually. By experience, I can safely say that the task of matching 256 edges is impossible.

But if you paste all 64 DOQQs into a mosaic, then split the mosaic into 64 parts, 224 of the edges are matched up automatically, leaving just 32 edges to match. If you work in adjoining mosaics, these 32 edges to match become only four edges (of the adjoining mosaics) to match.

When working with the sample DOQQs, creating a mosaic before cropping will facilitate edge-matching of most of the textures, preventing great aggravation and possible brain damage from beating one's head against the wall. So, careful attention while building your mosaic can overcome most of the problems.

## A Quick Review...

We will be using much the same setup and conventions as we used for the actual DOQQ images in the previous issue, so I will quickly review those techniques here.

### Staying Organized

Create a simple table grid using a word-processing program (or by hand with a ruler), consisting of eight rows and eight columns. At the four corners of this table, note the lat/long coordinates represented by the table. The table will represent a 30-minute square. Each cell will represent a 3.75-minute square, which in turn represents one DOQQ. We will use this to fill in the three-letter quarterquad codes that we will use for naming our textures and applying them to the proper terrain grids in ASD.

As well, keep an alphabetical listing of your three-letter abbreviations to avoid duplicating any. This is especially important if you are covering a broad expanse with photoreal texturing, since you will then have hundreds of three-letter abbreviations.

## Naming Convention

Devise a naming convention that will result in unique texture names. One that has worked well for me looks like this:

| Convention | Example |
|---|---|
| Three-letter USGS quadrangle code | LMY<br>(Lemoyne, PA DOQ) |
| Two-letter quadrant abbreviation | NW<br>(northwest quadrant) |
| Two-letter specific texture | TW<br>(top west) |

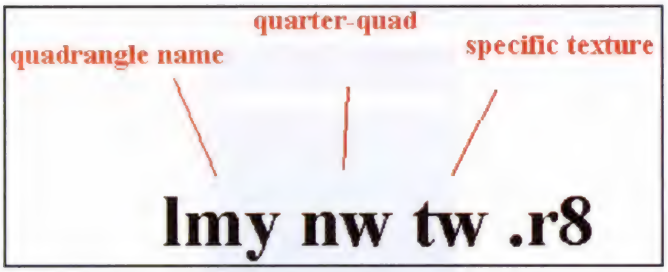



*Figure 1*

## Create Working Folders

Create processing folders, as shown in Figure 2.

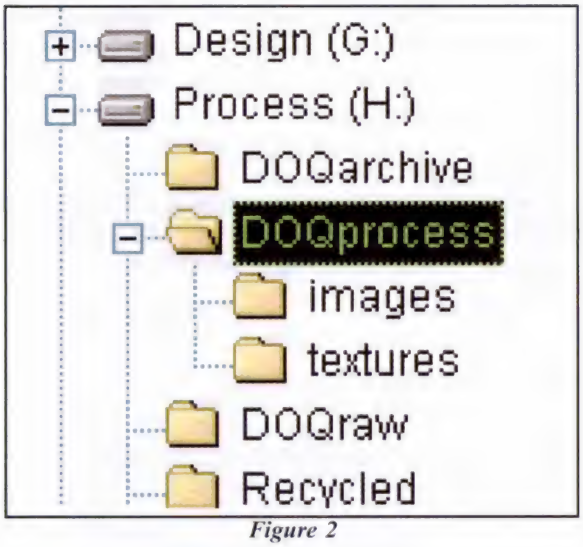



*Figure 2*

## Customize your Image-processing Application

(The following applies to Corel *PhotoPaint*, but should be easily adapted to other applications as well.)

Being able to simply click a button, rather than pull down menus and such, can greatly speed the process. We will be using several menu operations over and over, so creating taskbar buttons for these operations is a convenient way to quicken our progress.

Pull down *PhotoPaint*'s **Tools** menu and click **Options**. Click Workspace, then Toolbars. Click the Zoom/Hand Tool button on the Toolbar. Add the following buttons by dragging them up to the Property Bar: in the **Edit** menu: Copy to File; in the **View** menu: Zoom 100%, Zoom 1600%, Zoom to Fit, Snap to Guidelines and Rulers; in the **Image** menu: Rotate, Rotate Custom, Convert to Paletted, Convert to RGB, Resample and Stitch.

Now rather than finding these commands in the menu system, all we have to do is click the buttons on the Property bar.

## Methodology

Proper geo-referencing, as we've said in previous articles, is the essential element in the successful marriage of DEM terrain with DOQ images. This is achieved first by proper positioning of 225x225 arc-second terrain grids in ASD, then by precise cropping of the corresponding DOQQs at their four corner lat/long coordinates.

Briefly reviewing, each DEM that ASD uses to create terrain covers an area 1d x 1d. Each DOQQ covers an area of 3.75m x 3.75m (or 225s x 225s). Therefore, each DEM consists of 16 columns and 16 rows of 3.75m DOQQs. Each DOQQ will have a corresponding 225 arc-second x 225 arc-second terrain grid in ASD. This terrain grid size will result in a seamless boundary between DEMs, and also corresponds precisely to the size of the DOQQs. Each terrain grid will therefore have specific lat/long coordinates at each corner that corresponds precisely to the specific lat/long coordinates of the four corners of the DOQQ. This will result in proper geo-referencing of our textures.

The DOQQs must be properly cropped, since each DOQQ has a varying built-in overlap into the adjacent DOQQs. The use of either of two methods of cropping the DOQQs will depend on the source of our images.

The previous article discussed one method for use with actual DOQ images. This article will discuss another method for use with USGS sample DOQ images.

## Download the images

The first step is to download the images. Go to the USGS image search URL mentioned previously. Type in the coordinates of the four corners of your work area, less one minute. In other words, using the example in figure 3, we find that our work area extends from 40d N to 40d 30m N, and from 76d 30m W to 77d W. So we type in our search coordinates as shown in Figure 3.

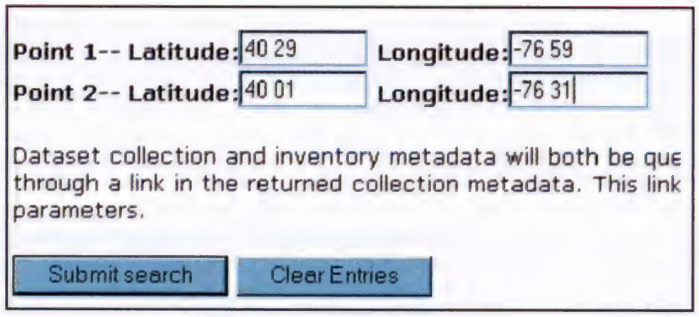

Point 1-- Latitude: 40 29
Longitude: -76 59
Point 2-- Latitude: 40 01
Longitude: -76 31
Dataset collection and inventory metadata will both be que
through a link in the returned collection metadata. This link
parameters.
Submit search
Clear Entries

*Figure 3*

If the whole work area is available, this search will return at least 64 images. Right-click on the Preview Sample link for each image and save them to your DOQraw folder (see Figure 6), retaining the name of the DOQQ and its quadrant (NW, NE...). During this download process you should keep your table grid handy and assign your three-letter names for each quadrangle into their proper cells by noting the metadata provided for each image to determine the correct cell for the image. We will be using this information to build the mosaic, and again to apply the textures to the proper terrain grids in ASD.

## Building the Mosaic

Once all 64 images are downloaded, we will begin stitching our mosaic together by first stitching together the eight individual DOQQs in each column. Refer to your table grid and open the eight DOQs of the first column in your image-processing program. Stitch them together, north to south. The result will be similar to that shown in Figure 4. Do the same with the other seven columns. At the end of this processing you will have eight longitude strips. Save these temporary working files with names that will make it easy for you to stitch them together a bit later in the proper sequence.

*Figure 4*

## The Rotation Factor

As you can see in Figure 4, the stitching process creates a sort of "stepped" appearance that is slightly slanted. This is a result of the Universal Transverse Mercator (UTM) projection of the images. In order for precise cropping of the mosaic to take place, we must compensate for this "slanting" by rotating the columns slightly before stitching them together into our full mosaic.

To determine the proper rotation, we must perform a bit of mathematics. Without going into a detailed description of the UTM coordinate system, I'll try to explain a bit about what we're dealing with here. Under the UTM coordinate system, the Earth is divided into 60 longitude zones, each six degrees wide. Each of these zones has a central meridian along which the rotational angle is zero. DOQQ columns west of this meridian will be rotated counterclockwise. DOQQ columns east of this meridian will be rotated clockwise. Each column of DOQQs will vary in rotation by .0375 of a degree.

First we must determine the central meridian of the UTM zone in which our DOQQs are located. This is most easily accomplished by using a handy Java applet found at http://www.internetgis.com/utm/calc.html, as shown in Figure 5. Using our ever-useful table grid, simply enter the lat/long coordinates found at one of the corners of the table into the Java calculator and note the value in the CM (Central Meridian) box. This is our zero starting point. If the longitude of your DOQQ columns fall west of this meridian, your columns will be rotated counterclockwise. If they fall east of this meridian, they will be rotated clockwise.

*Figure 5*

The simplified formula for determining rotation is as follows:

```
Longitude (decimal) - CM = X
X x 16 = Y
Y x .0375 = rotation
(-) rotate clockwise
(+) rotate counterclockwise
```

Say your DOQQs fall in zone 12, which has a CM of 111 degrees west and your 30-minute table grid starts at 113 degrees west. Using the formula above, we come up with

```
113.0 - 111 = 2
2 x 16 = 32
32 x .0375 = 1.20
```

So the first column of DOQQs west of 113 degrees west would be rotated 1.20 degrees counterclockwise. The second column west of 113 degrees west would be rotated 1.2375, the third 1.275, and so on. Since rotations beyond one-hundredth of a degree are very negligible, we round these figures to the nearest hundredth. Write these rounded figures at the top of the column on our table grid for future reference.

## Cropping the Mosaic

Now let's return to the eight longitude strips we stitched together earlier. Using the rotational values we wrote at the top of the columns on our table grid, rotate each longitude strip by its proper value. The previously slanted appearance of the strips will become "rectified." After rotation, crop the "steps" out of the images to make the edges even, with the exception of the rightmost and leftmost strips, which should only have the inside edges cropped. Also, do not crop the steps out of the top and bottom of the strips for now. We'll take care of the outer edges a bit later.

Once the eight strips are rotated and interior steps cropped out, stitch them together to form our complete raw mosaic.

This next step is where the geo-referencing all comes together. Our task now is to crop our mosaic as precisely as possible at their four precise corner coordinates. Here is where a detailed reference map will come in very handy. Again, using our ever-useful table grid, we know the northern and southern latitudes, and the western and eastern longitudes of the 30-minute square. Find these lat/long lines on your reference map.

If you have not already done so, click the ruler toggle on *PhotoPaint* (or the equivalent of your image processing application). Zoom in on the area of the southern boundary of the raw mosaic. Find a landmark of some kind—an intersection, a bend in a road or river, or something similar—and comparing the image to the reference map, pull a guideline off the top ruler down to your chosen landmark. Adjust as necessary until the guideline corresponds exactly to the corresponding latitude line on your reference map. Do the same with the other outer edges until all four guidelines are precisely placed along their respective lat/long lines.

Click the "snap to guidelines" button, then click the cropping tool. Drag the cropping tool to within tolerance of the guidelines and release. After double-checking to ensure they are snapped to, double-click on the image to crop. Save this master mosaic with a descriptive name. You may now delete all the original downloaded DOQQ, and the temporary stitched latitude strips to save disk space.

## Slicing the Mosaic

We will now slice the mosaic into its 16 component quadrangles, then slice each quadrangle into 36 individual textures.

Click the Image Info button to find the dimensions of the final cropped mosaic. Divide these horizontal/vertical values by four and write them down. Pull down the **Tools** menu (or equivalent) and choose **Grid & Ruler setup**. Create a grid using the values you just wrote down. Activate the *Show Grid* and *Snap to Grid* checkboxes. Click OK.

Your master mosaic image is now divided into four equal rows and columns by the grid. Click the Rectangular Mask Tool and drag it to fill the upper left cell of the grid. Click the Copy to File button and save to the DOQarchive folder we created earlier. Using our ever-useful table grid, name it according to its original USGS designation. These are our master images we will use later during the colorization process in a future article. But for now, we are just concerned about the texture placement (geo-referencing).

Continue with each of the 16 segments of our master mosaic until we have all 16 cropped DOQs in our DOQarchive folder.

## Using Scripts to slice the DOQs

This slicing process can be achieved with a utility such as *Paint Shop Pro*, but it is tedious and time consuming, since *Paint Shop Pro* doesn't support scripting, nor many other features found in the higher-end image applications. By using a higher-end application such as Corel *PhotoPaint*, we can use its scripting capabilities to record an image-slicing script once, then re-use this script for all subsequent images. This saves considerable time and meticulous labor.

While certain operations will need to be done manually, production rates can be significantly enhanced and errors can be greatly reduced by using various scripts to perform often-repeated tasks.

Open a master DOQ image from your archive folder. Click the image Information button to find the dimensions of the image. Divide the width and length values by six. Write these values down. If these values are not whole numbers, round up to the next whole number and multiply by six. Resample the image to these dimensions. Create a grid using the values you just wrote down, just as we did with the master mosaic. Activate the *Show Grid* and *Snap to Grid* checkboxes. Click OK. Our DOQ will now be divided into six equal rows and columns for a total of 36 cells.

Now click the Record button on the Script Recorder. Everything you do from this point forward will be recorded until you turn off the recorder. First, don't forget to apply your palette, either a custom palette you have created or the default fs.pal. (This palette step can be omitted if creating textures for FS 2000.) Then click the Rectangular masking tool and drag the mask out to fill the upper left corner grid box. It will snap to the grid line and you will see the marquee of the selected area. Click the Copy to File button and save the selected area to your DOQprocess\images folder following the naming convention we devised earlier.

Here again our table grid will help us stay organized. This DOQ consists of four quarterquads, NW, NE, SW and SE. Each quarterquad is further divided into three rows (Top, Center and Bottom) and three columns (West, Middle and East). Using our previous example of the Lemoyne quadrangle in central Pennsylvania, this carries the three-letter designation "LMY." Thus, beginning with the upper left segment of our DOQ, we would save this as lmynwtw.bmp. The second cell would be saved as lmynwtm.bmp, and so forth. Continue saving the segments until all 36 are saved to the DOQprocess\images folder.

Be especially careful while performing this initial slicing operation, since we are recording this script for future use and we don't want to make any mistakes here. After you have copied the last segment, stop the recorder and save the script for use on subsequent DOQs.

Close and save this master DOQ image and open the next one. Since we already have the slicing script, we only must open it with the script editor and do a search and replace for "LMY," substituting the three-letter code for the DOQ we're presently working with, again using our ever-useful table grid as a reference. Save the edited script, then run the script on the DOQ we have opened. Close and save the DOQ after the script completes, and go on to the next one. Continue until all 16 DOQs are sliced. Using the slicing script, we are able to create 576 images in a relatively short time.

But we're not through yet. We must now flip and resize all 576 sliced images to 256 x 256 pixels. We can create a script to run this process in the same manner that we created the slicing script. Open one of the 576 images and start the script recorder. Pull down the **Image** menu and choose **Flip,Vertically**. Pull down the **Image** menu again and choose **Resample**. Make sure to uncheck *Maintain aspect ratio* and resample to 256 x 256 pixels. Stop the Script Recorder and save the script.

Now pull down the **Tools** menu and choose **Scripts, Batch playback**. Choose all 576 images, then the flip/resample script we just created. Put a checkmark beside *Close file after batch playback*. In the Options box, choose "Save to a new folder" and browse to the DOQprocess\textures folder. Save as type can be "bmp." Click the Play button and let 'er rip. Go get a cup of coffee. When you come back, all 576 images will be flipped and resized.

Next, we will use *Paint Shop Pro*'s Batch conversion utility. Browse to the DOQprocess\textures folder and choose all 576 textures. Save as type ".raw" and save to your scenery's texture folder. (This conversion process can be omitted if creating textures for FS 2000).

Finally, create a batch file to rename *.raw to *.r8 (or whatever extension you're using for your textures). Now all textures reside in their final destination.

## Applying the Textures in ASD2

The process from here on is identical to the one used for the actual DOQQ images described in the previous article, but I will review them again here for the benefit of those who may have missed it.

Here we will again make good use of our ever-useful table grid we created in the beginning. We should have already placed all our 225x225 arc-second terrain grids in their properly geo-referenced coordinates as described in previous articles. Now it's just a matter of resizing the applicable 225 arc-second terrain grids to 75x75 arc-seconds, fill in the resulting gaps with other 75x75 arc-second terrain grids, and apply the proper textures to the proper grids.

Using our table grid as a reference, find the existing ASD terrain grid located at the upper left corner of our working area. Again using our example, zoom in, use the mouse and coordinate the readout on ASD's task bar to find 40d30m N and 77d W. Right-click on the terrain grid whose upper left corner is located on this coordinate. Choose **Properties** from the context menu. Resize from 225x225 to 75x75. Click the *Texture/Color* tab and in the Texture box, type in the three-letter designation for that quadrangle, the quarter-quad designation (nw) and the specific texture designation, "cm" (center middle, since by resizing this terrain grid it becomes the center middle grid in the quarter-quad). Resize all grids within our working area, naming them as described above according to three-letter designation, quarter-quad and specific texture, in this case, "cm." The result is shown in Figure 6.

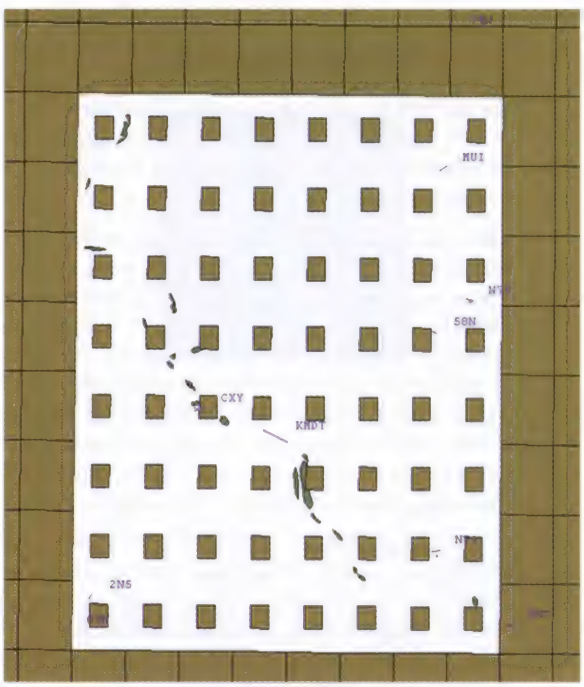



*Figure 6*

Now, here is a little trick to reduce the number of keystrokes we'll need to apply the textures. Pull down the **File** menu and choose **Preferences**. Click the *Terrain* tab. Make sure the *Insert Auto Size* checkbox is selected. Click the Set Size button and make sure it is set to 75x75 arc-seconds. Working by quarter-quad, type in the first five letters of the texture. For instance, if we are working with the Lemoyne NW quarter-quad, type "lmynw.r8" in the default terrain texture box. Click OK to get back to Map View. Click the terrain Tools and double-click in the top west position. The double-click will open the Terrain Properties dialog box. Click the *Texture/color* tab and add the "tw" designation to the end of the texture name. Click OK, and continue to place the other eight textures in the quarter-quad around the existing center texture. The result is shown in Figure 7.

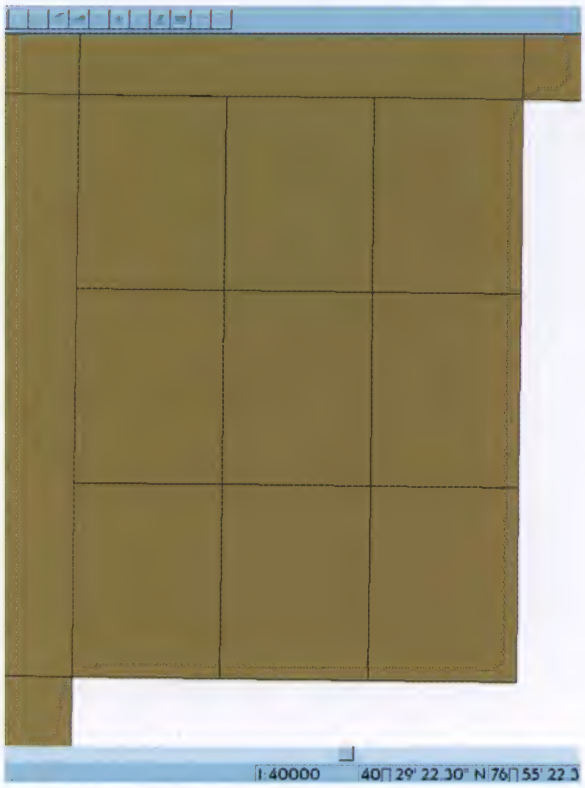



*Figure 7*

Open the **File | Preferences** again and click the *Terrain* tab. Change the default texture box from "lmynw" to "lmyne." Close and continue placing the grids on the northeast quadrant, and so forth until all the 75 arc-second terrain grids in our 30-minute square working area, are placed with the proper textures applied.

Now compile your work and observe the fruits of your labors. I think you'll find the satisfaction well worth the effort.

## FS 2000 Epilog

As I write, *Flight Simulator 2000* has been on the store shelves for about three weeks now, and the dissection of the new scenery engine has begun. While a complete understanding of the new engine will probably have to wait until the FS 2000 Scenery SDK is released, we do know the major change and enhancement is in the new terrain system. With this in mind, much of what I have described here will still apply, and some processes will fall away. The process of texture creation will remain much the same. However, we will no longer have to apply a specific palette, nor will we have to convert the textures to the raw .r8 format. FS 2000 can read plain old .bmps just fine, so these parts of the process will be streamlined. Plus, we will have an extra 64,000 or so colors to work with in addition to the present 256 colors. This opens new possibilities for photorealism.

As well, the next version of ASD will take advantage of the new terrain system features, and the way we apply the textures to the terrain will become much less convoluted, no doubt. As these new techniques are worked out, we will be bringing the details to you in future articles.

## Until next time, Happy Building!

**About the author.....**

**Justin Tyme is a well-known scenery design personality. His large scenery area projects include Pennsylvania, DELMARVA (Deleware, Maryland, Virginia) and Northern New Jersey. Justin is a busy guy. In addition to being a father of two young boys, he's finishing his BA at Indiana University of Pennsylvania. You can visit his personal website at http://www.fsgenesis.com.**

## Cool Easter Eggs

For an example of an FS 98 Easter Egg, do the following:

1. Select the **World | Secenery Complexity...** command. Set the "Image complexity" to the "Very Dense" setting.
2. Press [W] to remove the instrument panel
3. Select the **World | Go to | Exact Location...** command.
4. Enter N 041 59.51′ for the "Latitude" setting.
5. Enter W 087 53.56′ for the "Longitude" setting.
6. Enter 669′ for the "Altitude" setting.
7. Enter 005 for the "Heading" setting.
8. Click the [Close] button.
9. You should see a helicotper sitting in a quanset hut.

# A Visit To The SATCO Kansas City '99 Convention

By Tim Dickens

Since the introduction of Microsoft *Flight Simulator 5*, hobby enthusiasts have sought to enhance the realism of their virtual flights. Interacting with one another via the Internet became an instant hit several years ago when Fly By Wire was introduced, allowing FS 5 users to share the skies with their fellow enthusiasts.

An empty sky is a lonely place to be. With that in mind, flight simulation programs have offered software-generated Air Traffic Control (ATC). Although this programming relieves a bit of the solitude, the truth is you are really just interacting with your own computer.

When *SquawkBox* and *ProController* were introduced as freeware add-ons for Microsoft FS 95 in 1996, PC flight simulation enthusiasts were given an opportunity to attain one thing that programmed ATC could never offer: flying in a truly interactive environment with fellow simmers taking the role of virtual ATC controllers. With *ProController*, they could also act as the air traffic controller, leading other virtual pilots through controlled airspaces.

Although multi-player options are now available on contemporary flight simulation programs, there is no structure to this environment. These mass on-line convocations typically feature numberless (and anonymous) rocket ace wanna-be types slewing around Meigs Field at Mach 4 in a Cessna 182.

Virtual pilots interested in realism yearn for the same structured environment seen in real-world aviation. This is particularly true of virtual airlines devotees, where structure is part of the whole environment.

## What is SATCO?

SATCO is the Simulated Air Traffic Controller's Organization, dedicated to providing support and training to its members worldwide. It provides virtual ATC to users of the *SquawkBox* and *ProController* programs, both originally created by Jason Grooms. Joe Jurecka has now taken over the programming of the *SquawkBox* client.

The organization was formed to provide users, veterans and newcomers alike, with a resource to enhance their enjoyment of these programs. SATCO also has training sessions for controllers and pilots who want to learn more about air traffic control procedures. Several real-life air traffic controllers, as well as commercial and private pilots, participate in providing tutorials and training sessions for users.

SATCO offers simulator pilots and controllers the opportunity to interact in an online environment that is as real as you want it! There is no registration fee, no ongoing dues, and no glossy monthly magazine. And until now, there has not even been an annual meeting. But on Friday, August 20th, SATCO's senior staff and invited guests convened for the first time in Kansas City to discuss their plans for the future of this rapidly growing organization.

## SATCO Kansas City '99

The conference began Friday evening with a reception and banquet. The senior management presented some very interesting insights into where they see the organization heading and what new technology will be incorporated into this enterprise.

Randy Whistler (SATCO 1), the Executive Director, introduced all the key people involved in the operation. In fact, everyone involved in the day-to-day operation of the organization is a key person, from the street-level instructors to the division directors. But the ones particularly responsible for the SATCO we know today are few in number.

*Executive Director Randy Whistler speaks to the troops.*

One staff member who's been with SATCO almost from the start is Harvey Stein, from Canada. Harvey came onboard almost the first day and has stuck through all the hard times. Harvey is now the Human Relations Director. He works with the Chief Supervisor, Bill Raymond (Miami), the youth division (SATCO Youth, SATYTH), and SATCO's newest affiliate, the SATCO Wives Club (SATWYFE).

Another very key person is John Eisenhour, director of the networking division. John and his group, spread across the world, work to keep the servers running properly and in sync. He also assists the programmers with changes and testing of new software, etc.

Rick Gunderman takes care of the Virtual Airline (VA) and events. Neal Truitt is the Director of Conflict Resolution, and the newest HQ member, Mark Dashner, has taken the job of HQ training coordinator.

Last, but certainly not least, is Ray F. Jones, who acts as the director's right hand. Ray is the Director of Administrative Services for SATCO. He is responsible for the Web site, ratings files, and all the new automation that will be coming online hopefully before the end of the year. "Without everyone listed here," Randy Whistler says, "SATCO would have blown up long ago."

The SATCO roster currently lists more than 15,000 registered users, and they have recorded almost 6,000 unique users on their system since July. This means that SATCO has had one-third of their users actively participating during that period. On average weekday evenings, SATCO generally has around 110-150 users online. Weekends approach 250 users per day. If growth continues at this rate, Randy Whistler projects reaching 100,000 registered users on or before February 2002. While the FS community is large and varied, the number of people who will actively use their system might start to taper off at some time in the future, though right now it sure doesn't look like that will happen soon. Applications received during one month sometimes reach more than 300.

I asked Randy how they could handle all of the Internet bandwidth necessary to accommodate so many online users. "The problem really isn't bandwidth at this time," he replied, "but rather server software that was never intended to operate at the level we're asking it to run at today. Software is being developed now that should help reduce, if not eliminate, this problem. The other major problem we have is the Internet itself. It's kind of like a living thing; it has good days and bad days.

The good days, life is great. The bad days, well, let's not go there."

Randy reflected on how it all got started:

When the very first clients were introduced in '96 (I think, maybe late '95) it was a real mess—anarchy online. Of course, it wasn't near as big as it is now, with stand-alone servers, etc. There were usually about 60-80 users online at one time. Everyone did what they wanted to, and very few had any idea what to do. It was a real mess. I was sitting at the PC one weekend, thinking that someone needed to prepare a site where these users could study the ATC environment and get together better.

That's where it all started. I suggested this idea to Tom Allensworth (AVSIM) and John Greene, a Canadian. These two were the ones who were running the two most-used servers at that time. They thought it was a good idea, and off we went. As things snowballed, we grew and stumbled at various times. For some reason, I just kept plugging ahead, never giving into the growing frustration and troubles. I suppose it's mostly because I love aviation, but I really believe in what we have created. From the beginning, I think I always had an inkling of what it could become. I just never was smart enough to realize it fully until much later!

Randy quipped that had he actually realized what it would grow to, he might have run away screaming at the very beginning!

I also asked him who bears the cost of running such a vast undertaking.

We've looked at costs several times in the past and recently also. Our estimate at this point is that it costs those inside SATCO who bear the majority of the costs about $15k per year. This is for connections, Web sites, administration costs, etc. This doesn't even include those people who provide us servers to operate and administer. We have considered several options, from becoming a for-pay service, to finding some sort of corporate sponsor. At present, we're doing the background work to be able to make a move at some point in the future, but there are a lot of variables involved, and what that move will be we don't know at this time. I suspect that, if we continue to move and grow as we are now, we will soon have to find a method to cover the costs of the system.

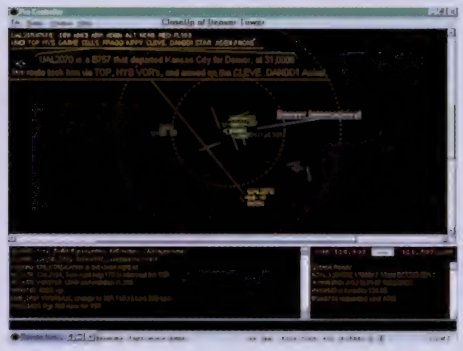
## A nice tour

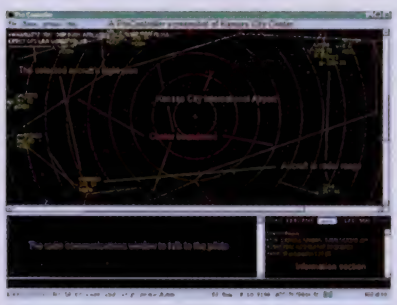
On Saturday morning we were invited to visit Kansas City air traffic control center and the Kansas City International control tower and TRACON (Terminal Radar Approach Control) facilities. We got a chance to meet the controllers on duty and see how the real thing operates. It was a very interesting experience.

## What is ProController?

*ProController* is the software that users incorporate to participate as air traffic controllers. It provides a realistic display for use by ATC positions from ground controller to center controller.

Controllers interact with live simulator pilots using *SquawkBox* via text (and likely voice in the near future). Multiple communications channels allow you to coordinate with other controllers via ATC frequency. They'll even handle emergencies, just as controllers do in the real world.





*The* **ProController** *interface allows members to participate as actual air traffic controllers with a very realistic user environment.*

## What is SquawkBox?

*SquawkBox* is the software package that allows air traffic control and the pilot to communicate within the FS95 or FS98 environments. *SquawkBox* works through a worldwide network of servers that connect you to users of *ProController* (the radar screens). It allows pilots and controllers to interface with real people, not with a preformatted ATC program/module that is not capable of listening to you.

When *SquawkBox* is combined with air traffic control via *ProController*, you can see other aircraft visually (in FS98 only). Automatic real-world hourly weather updates, based on your position as you fly, are provided every five minutes. *SquawkBox* also includes a Flight Management Computer (FMC), with full navigation functions and aircraft speed control. These combined functions allow you to define routes and have the aircraft fly the route automatically through Terminal Control Areas (TCA) and also communicate with approach control.

*The* **SquawkBox** *interface puts pilots and air traffic controllers together in the FS 95 and FS 98 environments.*

## Hands-on look at SATCO

Saturday afternoon was a real treat for me. Although I had known a lot (I thought) about SATCO for some time, I never took the opportunity to use the system myself. This day I had the opportunity to participate in their roundtable discussions and get first-hand exposure to what SATCO is all about.

*The roundtable discussions were both informative and engaging.*

*Randy Whistler demonstrates some of the exciting new systems coming on line.*

To a newcomer like me, this look at the SATCO virtual world was fascinating. In addition to the unique features of the *ProController* and *SquawkBox* programs, a new dimension to simulated air traffic control is now beginning to take shape: the addition of voice communications.

Everyone involved in SATCO has always said that voice communication was needed, but for a long time there was no viable solution. When *Roger Wilco* (RW) and *Battlecom* (BFC) came out, SATCO looked at both. SATCO chose BFC as their first choice, since it offered the flexibility needed. The bad part was that it was a for-fee software package. When they could not obtain a decent price break for SATCO users, they started looking at *Roger Wilco*. Shortly thereafter, Microsoft bought BFC. The creators of *Roger Wilco* then stepped up to the plate and began actively working with SATCO programmers to find a way to help. With RW's help, the system has now progressed to the point that the new 2.2 version will be coming out soon, which will have an interface inside it to switch frequencies directly out of *SquawkBox*. This should allow a level of reality that, until recently, members only dreamed of having.

I had an opportunity to try a prototype of this new system, and it was quite impressive. It truly does add a new dimension to virtual flight. Being able to interact by voice with an actual person performing the controller function is exactly what flight simmers have been looking for in an ATC interface. Pre-programmed ATC simulator functions or programmed adventures just do not hold a candle to it.

And of course, the *ProController/SquawkBox* system is the only thing available for those who wish to participate during a session as the controller, rather than as a pilot. Many SATCO members really enjoy working the airways as controller, and there always seems to be plenty of them out there in the airspace in which you are flying.

What does the immediate future hold?

I asked Randy to discuss what he sees in the near the future of SATCO. He told me, "We don't have any immediate changes planned, but rather, we are consolidating what we have now. In the last few years, we've been reactive instead of proactive. We're now at the point that we can become proactive. Some of the immediate changes will be a common training structure across the organization, standardized rate levels, integrating new and interesting products, and the addition of some new divisions. Honestly, I couldn't say what the future would hold. A lot of it will depend on the costs of the implementation, the costs to operate the system, etc."

My impression is that SATCO is going to become a major aspect of virtual flying in the future. With the rate of growth the organization is seeing in its membership, I don't think this feeling is unwarranted. The entire SATCO organization, from the members to the senior management, is extremely dedicated to making this the most realistic ATC environment possible for flight simulation. I can hardly wait to see what happens next!

## System Requirements *(minimums)*

***To use ProController***
Windows 95 or NT
8 MB of RAM (16 or 32 MB highly recommended)
1 MB of hard drive space

***To use SquawkBox***
A PC-compatible
Microsoft Flight Simulator for Windows 95 or Microsoft Flight Simulator 98.
Your licensed copy of one of the two Flight Simulator versions.
Adam Szofran's FS6IPC (Included in SquawkBox full download)

***To use the SATCO network***
Pilot ID (PID) or your Controller (CID).

***To use the International Virtual Pilots Association (IVAO) network***
You must sign up with IVAO.

To view the FMS correctly, your desktop should be configured to use small fonts.

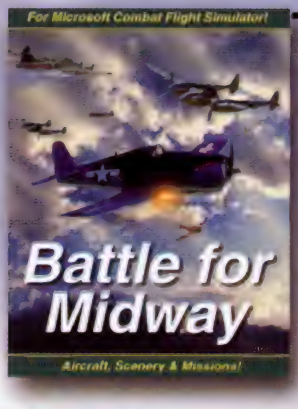
ID numbers and IVAO signup may be obtained on the Internet at http://www.ivpa.com/index.htm.

Information on SquawkBox is available at http://www.avsim.com/mike/sb_pc/sbhome.htm

More information is available at http://www.avsim.com/mike/sb_pc/pchome.htm.

***You can get more information on SATCO at: http://www.satco.org***

# Join The Fight!
## With These CFS Add-Ons!




### Battle for Midway

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Fly twelve of the most famous U.S. and Japanese planes that fought over the Pacific in the first *Combat Flight Simulator* add-on to combine all the elements you want—new aircraft, new scenery and new missions!

Showcasing detailed scenery of 1941 Pearl Harbor and the Hawaiian Islands, *Pacific Theatre* provides you with jarring WWII action!

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Fly authentic aircraft featuring panels from this era and new "moving parts"technology. Patrol the mountainous scenery of Burma and South China, accurately portrayed with realistic elevated mesh terrain & featuring "exploding scenery," barracks & buildings.

**$39.95 US/$54.95 CAN**

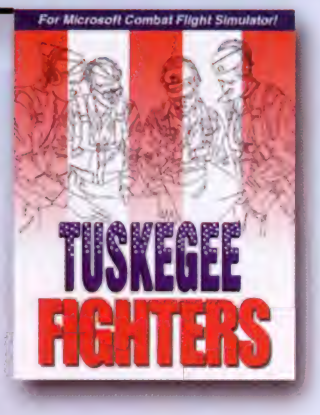
**$39.95 US/$54.95 CAN**

### Tuskegee Fighters

Fly the authentic aircraft of the Tuskegee pilots, featuring instrument panels from this era and "moving parts" control surfaces.

Features authentic missions from the past, all based on historic events, recreating actual combat encounters and surreptitious reconnaissance flights.

Aircraft includes the Stearman trainer and famous P-51 Mustang!

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# Bourget '99

## *My Day at the Paris Air Show*

### *By Phil Paschutine*

Conveniently located nine kilometers from Paris at the Bourget airport, the Paris Air Show is held every two years. A total of 286,037 visitors came from 147 countries arrived for the 1977 show that featured 1,860 exhibitors from 46 countries. This year, 40 countries were exhibiting some 190 aircraft, 13 of which were new exhibits (see inset 2). Seventy-three exhibitors made flight presentations.

It all started in 1908 when Gustave Rives exhibited aircraft at an automobile show. The next year Robert Esnault-Pelterie and André Granet launched the first Paris Air Show, which was held inside le Grand Palais in the center of Paris and featured about 400 exhibitors. Each year thereafter, with a halt during the First World War, the Paris Air Show was held at the same location until 1924, when the show became biannual. To accommodate flight presentations, the show relocated to the Orly airport in 1946. Bourget has hosted the show since the early 1950s.

With each new show, the Paris Air Show increased its worldwide reputation, and the list of foreign exhibitors grew from 14 countries in 1969 to 46 in 1997. The exhibited planes include the sleek Concorde, Mirage 2000, Airbus A320, SU25, SU27, Antonov 225, Buran space shuttle, Mig28, A10, Boeing 777, TU160, Sukhoi32, and the Blériot! The list is endless!

I attended on the trade days, when the place wasn't as crowded as on the public dates (good thing too!). First, I rushed to ask exhibitors for an appointment. Remember that priority is given to customers, so I was lucky to be told to come back at such and such time. All the people I met were very kind, taking time to answer my questions and show me their aircraft.

Two flight simulation exhibitors were present, the French National Simulation (F.N.S.) association (http://www.fly.to/fns.fr) and Microsoft. Microsoft had several PCs running *Combat Flight Simulator*, but their representatives seemed occupied, so I didn't bother them.

The F.N.S. exhibit was very active. Alain Apers founded the association three-and-a-half years ago, and it now has 13 affiliated associations and over 1,600 members. Apart from flight simmer gatherings, they issue a CD-ROM containing many utilities, panels, scenery and reviews of FS add-ons.

## The First Day of the Paris Air Show 1999: The Classic Pancake

After a series of classic flight maneuvers, a Sukhoi-30MK (prototype) failed to respond and fell like a brick. Pilot Vyacheslav Averynovt dove to regain control of the jet. As he flattened out and tried to climb, the rear end slammed on the runway and the engine caught fire. Both pilots ejected at 150 ft and safely returned to Earth, though the plane was destroyed.

Approximately 190 aircraft were displayed. I started early at 7am — intending to see each, however, with time, the heat and my feet reminding me that I was only human with each step, I realized that I couldn't see it all in one day. Therefore, I have selected a few aircraft that attracted my attention. The remaining pictures will show you some of the other planes exhibited.

# Military

## Antonov –70

A joint Ukrainian-Russian production, the Antonov –70 is a widebody STOL (short take-off and landing) military cargo plane. Its first flight lasted 28 minutes on December 16, 1997. The first prototype was lost after a mid-air collision with an Antonov -72. The second prototype flew on April 24, 1997 at the Ukrainian Gostomel flight testing facility. This aircraft has a maximum payload of 47 tons. It can airdrop vehicles, cargo and paratroops. There are also tanker, ambulance and patrol versions.

| Antonov-70 | |
|---|---|
| **Power plant** | |
| Engines: | four 10,300 kW Progress D-27 |
| Propeller: | Stupino SV-27 contra-rotating propfans. Each engine has eight composite blades in front and six at rear. |
| **Performance** | |
| Cruising speed: | 750-800 km/h |
| Cruising altitude: | 9,000-12,000 meters |
| Regular take-off/landing on concrete or unpaved runway: | 1,800-2,200 m (1) |
| Short take-off/landing on unpaved runway: | 600-900 m (2) |
| Service range (with 47-ton payload): | 1,350 km (1) |
| Service range (with 20-ton payload): | 7,400 km (1) / 3,000-4,900 km (2) |
| Crew: | 3-5 |
| **Dimensions** | |
| Wing span: | 44.06 m |
| Length: | 40.25 m |
| Height: | 16.3 m |

This mammoth long-range, heavy airlift aircraft can carry a payload of 150 tons. The whole aircraft is impressive. Lay some artificial grass inside and you can play a football game—that is how big the interior is! It has two twin nose wheels and 10 wheels on each side. Some ex-soviet countries' aircraft may get the award

for the weirdest or most *avant-garde* oversize design and the greatest number of engines or landing gear, but they can fly. I asked to see the cockpit, but the answer was Nyet.

| Antonov –70 | |
|---|---|
| Power plant | |
| Engines: | 4 Lotarev D-18T turbofans, each rated at 23,400 kg of thrust |
| Performance | |
| Service ceiling: | 12,000 m |
| Range with maximum payload: | 4,500 km |
| Range: | 16,500 km |
| Speed: | 865 km/h |
| Empty weight: | 175,000 kg |
| Maximum weight: | 405,000 kg |
| Normal cruising speed: | 800-850 km/h |
| Maximum cruising speed: | 865 km/h |
| Passenger seats: | 88 |
| Crew: | 6 |
| Dimensions | |
| Wing span: | 73.3 m |
| Length: | 69.1 m |
| Height: | 21.08 m |

## Lockheed Martin C-130J-30 Hercules

Bring your popcorn—you can pop it in the cockpit, which includes a microwave oven, a coffee machine and two bunk beds. How is that for comfort? A "softpanel" running through the Flight Management System (FMS) can start the engine (software emulation), or any instrument in the panel. The panel includes LCD instrument readouts (for navigation, aircraft flight control and operating systems). The two heads-up displays (HUD) and four heads-down displays (HDD) are night vision imaging system compatible. The C-130J-30 also has two mission computers and two backup bus interface units, providing dual redundancy for the systems. The computers also have an integrated diagnostics system.

### Missions

The C-130 can carry 128 troops, plus vehicles and armaments into battle or drop 92 paratroopers and pallets of supplies. It also serves in a medevac role (97 litters) and in humanitarian actions. It can even perform airborne early warning and maritime surveillance.

**New exhibits at the 1999 Paris Air Show**

- Belgium: M 80 MASQUITO (helicopter)
- Brazil: ERJ 135
- China: K8 jet trainer
- Czech Republic: L159
- France: EC 635 mockup and EC 155 B
- Italy: A 119 Koala
- Russia: BE 200
- Ukraine: AN 70
- USA: B 717 – 200, RAH 66 Comanche, Fairchild 328 J, Proteus

| Lockheed Martin C-130J-30 Hercules | |
|---|---|
| **Power plant** | |
| Engines: | 4 Allison AE2100D3 |
| Propellers: | composite six-blade Dowty Aerospace R391 |
| **Performance** | |
| Initial cruise altitude: | 28,000 ft |
| Roll-out take-off (sea level and 15°C): | 3,080 ft |
| Time to climb to 17,000 ft: | 11 minutes |
| Range: | 3,150 nm (no auxiliary tanks) |
| Maximum cruising speed: | 348 kts |
| Economy cruising speed: | 339 kts |
| Stalling speed: | 100 kts |
| Maximum rate of climb at sea level: | 2,100 ft/min |
| Take-off run: | 3,290 ft |
| Take-off run using maximum-effort procedures: | 1,800 ft |
| **Dimensions** | |
| Wing span: | 132.6 ft |
| Length: | 97.75 ft |
| Height: | 38.8 ft |
| Tailplane span: | 52.7 ft |
| Wheel track: | 14.25 ft / 4.34 m |
| Propeller diameter: | 13.5 ft |
| Wing area (gross): | 1,745 sq. ft |

On Sept. 9, 1998, Lockheed Martin was granted type certification of the commercial variant of the C-130J-30 configuration.

## CASA

CASA, maker of the C-212, CN-235, C-295 transport utility aircraft and C-101 trainer, has been exhibiting its aircraft in Paris since 1979 and recently merged with Daimler Benz. CASA has collaborated in the Eurofighter project and designed, developed and manufactured several structural components built into all of the Airbus models, including the Beluga. CASA builds key structural elements for the Ariane 4 and 5 launchers. CASA is also actively participating in the Airbus Military Company consortium within the European FLA (Future Large Aircraft) project.

## CASA C295

Originally used for military transport, this 24.5 ft compact aircraft can be used in many configurations: troop ferry, intensive care unit (carrying 12 stretchers) or medevac (with 21 stretchers), maritime patrol, fighter engine transport (three EJ 2000), pallet transport (five 88' x 108') or aerial delivery and vehicle transport (three light range rover type).

The C295 is a stretched version of the CN-235 that will enter service in 2000. The aircraft being a prototype, I was not able to take pictures of the cockpit—the instruments onboard were not representative of the finished version. I was, however, able to visit and saw that state-of-the-art avionics Collins/Sextan instruments were standard issue. (The production planes should have Sextant Topdeck avionics suite; see inset 1.) Liquid crystal displays, provision for two HUDs, fully NVG compatible, an open integrated architecture featuring two central data processor interface units and standard digital buses (mil 1553B, ARINC 429) make this a state-of-the-art aircraft. The military version FMS has four-dimensional navigation, IRS/GPS integrated in the system, color weather radar (featuring search and beacon modes) and ground mapping, plus HARP (High Altitude Release Point) and CARP (Computed Air Release Point) capabilities. There is also a GPWS and TCAS. Of course, there is a potential to include enhanced TCA and GPWS, dedicated mission sensors, video from FLIR or cameras and SATCOM.

This aircraft can land on just about any type of strip, including loose, dry sand, tilled farmland, turf or moist clay.

| CASA C295 | |
|---|---|
| Power plant | |
| Engines: | Pratt & Whitney Canada PW 127 G with a normal take-off power of 2,645 SHP |
| Propellers: | Hamilton standard 568F-5 (6 composite material blades, 12.9 ft in diameter) |
| Performance | |
| Cruising speed: | 260 kts |
| Cruising altitude: | 25,000 ft |
| Range: | 730 nm (maximum payload of 9,700 kg) |
| Maximum take-off weight: | 23,200 kg |
| Maximum landing weight: | 23,200 kg |
| Take-off distance: | 962 m |
| Landing distance: | 774 m |
| Maximum range: | 2,850 nm |
| Maximum range with full payload: | 720 nm |
| Fuel capacity: | 7,650 liters |
| Dimensions | |
| Length: | 24.45 m |
| Wing span: | 25.81 m |
| Cabin: | 12.69(L) x 1.90(H) x 2.70(W) m |

## CASA CN235 S300

Configurations: paratroops (48), aerial delivery (LAPES, HAD 88' pallets), medevac (21 stretchers and four medical personnel), logistic transport (6-ton payload), fighter engine transport (two F404 or EJ200).

Other versions are electronic warfare, early warning, navigation school, photogrammetry, maritime patrol, traffic and smuggler control, search and rescue, humanitarian missions, etc. This aircraft has FAR 25 certification.

| CASA C295 | |
|---|---|
| Power plant | |
| Engines: | Two GE CT7-9C3 (1,750 hp) |
| Propellers: | 12-ft diameter Hamilton standard 14RF-37 |
| Performance | It is pressurized and can operate at an altitude of 25,000 ft, with a cabin pressure equivalent to 8,000 ft. |
| Maximum cruising speed: | 246 kts |
| Maximum take-off weight: | 16,500 kg |
| Maximum landing distance: | 16,500 kg |
| Take-off distance: | 745 m |
| Landing distance: | 603 m |
| Maximum payload: | 6,000 kg |
| Maximum fuel: | 5,220 l |
| Passengers: | 68 seats in troops version or 78 seats |
| Maximum range: | 2,700 nm |
| Range with full load: | 700 nm |
| Dimensions | |
| Length: | 21.40 m |
| Height: | 8.17 m |
| Wing span: | 25.81 m |
| Cabin: | 9.65(L) x 1.90(H) x 2.70(W) m |

## P-3 Orion

This antisubmarine and antisurface warfare aircraft first flew for the US Navy in 1962. P3C Orions were used during Desert Storm. They monitored shipping in the Persian Gulf and passed targeting information to tactical aircraft. P3s are also used in UN humanitarian actions and anti-drug patrols.

| P-3 Orion | |
|---|---|
| Power plant | |
| Engines: | 4 Allison T-56-A-14 turboprop engines (4,600 SHP each) |
| Performance | |
| Maximum take-off weight: | 139,760 lbs |
| Maximum speed: | 405 kts |
| Cruise speed: | 350 kts |
| Ceiling: | 30,000 feet |
| Range: | Typical mission: 10-12 hours duration; Maximum endurance: 14 hours |
| Crew: | 10-12 |
| Dimensions | |
| Length: | 116 feet, 8 inches |
| Wing span: | 99 feet, 7 inches |
| Height: | 33 feet, 8 inches |

## SAAB 340 AEW

In 1994, the first SAB 340 AEW was delivered to the Swedish Air Force. It carries an Ericsson Erieye radar in a rectangular pod on top of the fuselage that uses an active array with 2,000 solid state modules. The range of the S-band 3Ghz radar is 300 km, the look angle is 160°. The SAAB AEW is only used in Sweden. Other versions such as the 340 and 2000 are used for civilian transport in Europe and eastern European countries.

| SAAB 340 AEW | |
|---|---|
| Power plant | |
| Engine: | 2 st General Electric CT7-9B turboprops |
| Engine thrust: | 3,550 hp |
| Performance | |
| Patrol speed: | 160 kts |
| Patrol altitude: | 6-7,000 m |
| Maximum altitude: | 7,600 m |
| Cruise speed: | 528 km/h (285 kts) |
| Endurance: | 7 hours (can be fitted with external, underwing fuel tanks) |
| Empty weight: | 8,140 kg |
| Maximum take-off weight: | 13,155 kg |
| Maximum speed: | 453 km/h |
| Dimensions | |
| Wing span: | 21.4 m |
| Length: | 19.7 m |
| Height: | 6.9 m |
| Performance | (Saab 340 commuter version) |
| Take-off field length: | 4,230 ft |
| Landing field length: | 3,395 ft |
| Maximum cruise speed: | 285 kts |
| Range (standard cabin): | 785 nm |
| Service ceiling: | 25,000 ft |

# Helicopters

## Bell Agusta

The Bell Agusta is both a helicopter and a plane. With the tiltrotors in the vertical position, it can take off, hover and land like a regular helicopter. With the tiltrotor in the horizontal position, it flies like a regular turbo prop. Transition time from the vertical to the horizontal position is 20 seconds.

| Bell Agusta | |
|---|---|
| **Performance** | |
| Cruise speed: | 275 knots |
| Maximum unrefueled range: | 750 nm (1,000 nm with auxiliary fuel tanks) |

## CH47D Chinook

This medium transport helicopter is easily recognized by its two mammoth rotors.

| CH47D Chinook | |
|---|---|
| **Power plant** | |
| Engines: | 2 turboshaft Allied Signal 55-L-714A of 5,024 hp with FADEC |
| Rating: | Continuous output (at sea level): 3,069 kW per engine. Emergency: 3,704 kW (2.5 minutes) |
| **Dimensions** | |
| Length: | 15.88 m (30.18 m including turning rotors) |
| Width: | 3.79 m (18.29 m including turning rotors) |
| Height (aft rotor turning): | 5.77 m |
| Height (aft rotor still): | 4.90 m |
| Cabin size: | 9.30 m (L) x 1.98 m (H) x 2.28 m (W) |
| Rotor diameter: | 2 x 18.29 m, 3 blades, 218-227 rpm |
| **Performance** | |
| Maximum take-off weight: | 24,494 kg |
| Maximum speed: | 197 mph (311 km/h) |
| Range: | Normal mission: 156 miles |
| Unladen: 313 miles | |
| Internal load: | 34 combat-ready troops or 13,343 kg freight or a combination of the two |
| External load: | 3 cargo hooks under helicopter: forward and aft hooks maximum: 9,072 kg center cargo hook maximum: 12,700 kg |
| Fuel: | 3,913.7 liters in several tanks (useful load with fuel tanks: 10,200 kg) |
| Crew: | 2 pilots, 1 flight engineer/loadmaster |
| Empty weight: | 11,151 kg |

# Civilians

## Galaxy Aerospace

The galaxy is a business jet. It seats eight people in a long-range configuration and 18 in a corporate-shuttle configuration.

The interior dimensions of the cabin impressed me: 6.3 ft high x 7.2 ft wide and 24.5 ft long, so you do not feel claustrophobic on a Paris-NY flight. This super midsize business jet costs around $17 million.

| Galaxy Aerospace | |
|---|---|
| Power plant | |
| Engines: | Pratt & Whitney PW306A with a 6,040 lb. thrust rating per engine |
| Exterior dimensions | |
| Height: | 21.5 ft |
| Length: | 62.3 ft |
| Wing span: | 58.1 ft |
| Performance | |
| Maximum take-off weight: | 5,900 kg |
| Landing distance: | 3,400 ft |
| Cruise speed: | 470 kts/.82 M (sea level to 15,000 ft) is 310 kts and 360 kts (15,000 ft to 25,000 ft): 0.85 M |
| Maximum range: | 3,620 nm |
| Maximum altitude: | 45,000 ft |

## Gulf Air's airbus A330-200

I was invited aboard Gulf Air's Airbus A330 for champagne and toasts. This aircraft, delivered to Gulf Air on June 15th, 1999, made her maiden flight from London to Bahrain on the 22nd. First class seats are just too much to describe, but I will try: 80 inches reclining seats with footrests, adjustable lumbar support, full leather with private reading light and a 10.4-in. touch screen, which offers 26 audio and 24 video pretaped channels—two of which are cockpit and outside views. The 12 seats in first class provide plenty of leg room. Business class has 24 of the same and economy has 207 seats. All seats have a telephone to call people onboard or make a call via satellite (costs about $10 a minute) and a moldable headrest. Economy seats have a small video screen on the back of the seat. The "economy" class is much better than business class on some other carriers.

Standing alongside the A330-200 was Gulf Air's first aircraft. An Avro Anson (G-AIWX) still in its original livery. Freddie Bosworth registered Gulf aviation Company on June 1st, 1949. He operated from Muharraq in Bahrain and at first offered regular flights between Sharja and Muscat and charter service to Beirut and Karachi.

## Military simulation

### British aerospace flight trainer

No superlatives are strong enough to describe the awesome sensation I felt in this simulator. The three panels provide peripheral vision, and this is quite a change from our PC's single monitor. Maybe I will use three monitors from now on!

I'm not an airjock and I take flying dead seriously (even in FS), but since I had the opportunity, I forgot all about safe flying and indulged in some nasty rolls, sharp turns and other suicidal aerobatics one wouldn't normally do. I eventually ended up in a flat spin, but I recovered by applying standard procedures (maybe it's a forgiving sim?).

### Dassault Mirage 2000-5 flight trainer

Unfortunately, I was not able to take pictures of the instrument panel, but wouldn't you like to have this type of sim in your garage?!

## Experimentals

### Proteus

Proteus was a Greek god, a shepherd of the sea who could change his form. Definitely alien-looking from the outside and very conventional on the inside, this Proteus is a high-altitude (48,000-66,000 ft) multi-mission aircraft that can adapt its middle fuselage section (the dedicated payload component) and adjust it aerodynamic properties by extending its wingtips and canard tips.

| Power plant | |
|---|---|
| Engines: | twin turbofan Williams International FJ44-2E |
| **Performance** | |
| Gross weight: | 12,500-14,200 lbs |
| Fuel: | 5,500-6,300 lbs |
| Payload: | up to 6,900 lbs |
| Pilots: | 2 (a third is optional) |
| Endurance: | up to 14 hours (12 hrs on station with a 12,500 lbs take-off weight) |
| **Dimensions** | |
| Span: | 78-92 ft |

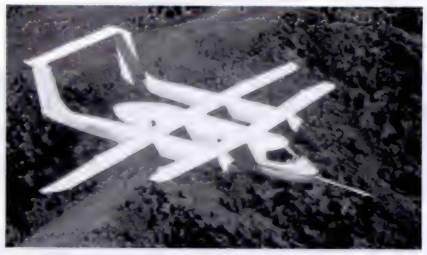
## *Missions*

elecom, communication data/relay, reconnaissance, atmospheric research, commercial imaging, space tourism and micro satellite launch.

The Proteus was a Scaled Composite project from the same people who brought you truly *avant-garde* but highly flyable aircraft such as the Voyager (Rutan Aircraft Factory and Voyager aircraft project), the Triumph business jet, Pegasus launch vehicle, freewing scorpion UAV (unmanned aerial vehicle), Bell Eagle Eye tiltrotor UAV, Advanced Technology Tactical Transport, ARES and many more.

*Triumph business jet*

*Freewing scorpion UAV*



*Advanced Technology Tactical Transport*

*In the land of the weird, how about this little home-made "craft?"*

*The ARES aircraft*

To conclude, here is a cute quote I overheard: "This here, son, is the machine gun," said the father to his 10-year-old. The "machine gun" was, in fact, the pitot of a heavy jet. You meet all kinds.

## Sextan Topdeck Avionics suite

- Four 6x8-inch liquid crystal displays and associated control units
- One integrated electronic standby instrument IESI
- Two IFC cabinets with the autopilot module
- Flight management system (FMS) module and sensor interfaces
- Two multi-function control and display units (MCDU)
- Two ADU 3,000 air data units and two attitude and heading reference systems (AHRS), plus provisions for two head-up displays
- Totem 3000 laser gyro navigation system (optional)
- Among the set of equipment that implement communication identification and navigation functions, Sextant provides two multimode receivers (MMR), two GPS receivers and one radar altimeter.

**I wish to thank the following people:**
**Mr. J. Miller of Galaxy, Mr. C. Wilson of British Aerospace, Mr. F. Navarro of CASA, Miss Maria Hally of Gulf Air; Lockheed Martin and Jean-Claude Gicquel (pictures).**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## Gaming on a Budget

# Using New Simulators without Going Broke

So now you have decided that it's time to upgrade your system. The games and simulations you purchased over the past few months just don't play as nicely as you feel they should. That Pentium 166 MHz or 200 MHz MMX cost an arm and leg when you first got it, but today it's essentially an expensive word processor. *Falcon 4.0*, *Combat Flight Simulator*, *Fly!*, *Flight Simulator 2000* and *Flight Unlimited III*, along with some of your other favorite entertainment titles, play slower than molasses on it. Before depression sets in, there is a silver lining to those dark clouds. You can significantly upgrade your present system without taking out a second mortgage.

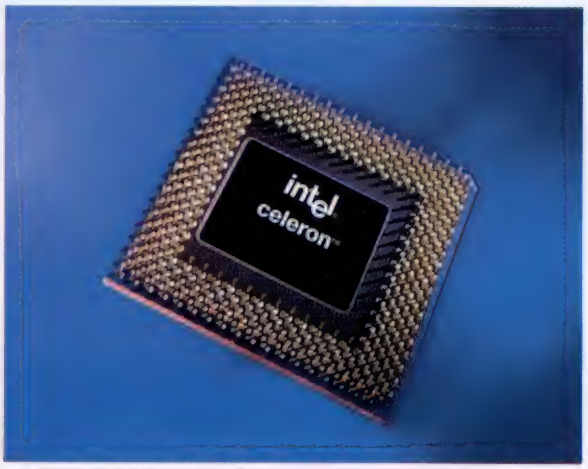
First, let's determine if you need to completely upgrade

- Are you running a first generation Pentium-class machine (60 MHz to 233 MHz Pentium, not a Pentium II or Pentium III)?
- Does your current motherboard lack an AGP slot?
- Are you running mostly ISA expansion cards?
- Is 64 MB of RAM the maximum limit your PC can handle?
- Are the programs you want to run playing choppy, so that most just aren't as enjoyable as you feel they can be?
- Is your hard drive no bigger than one gigabyte?
- Does your current PC lack USB ports?

If you answered yes to most of those questions, it is definitely time for a system upgrade. Thankfully, today it doesn't cost an arm and a leg to upgrade to a moderately fast system. There are a few ways to do this, but I'll start with the complete purchase method.

### Purchasing a new computer

Today a bargain PC can be purchased for about $900.00 or less. Most come with a 15-inch monitor, 64 MB of SDRAM, at least a 6.4-gigabyte hard drive, an AGP graphics card/3-D accelerator, a 56k modem, a 366-400 MHz Intel Celeron CPU, and a keyboard and mouse.




*Intel Celeron CPU*

I have four PCs at home. Three are in my office and a fourth is in my kid's room, and all of them are networked together. The slowest machine is a P II-266 MHz, outfitted with 64 MB of SDRAM and a decent 3-D accelerator card. It still runs many of today's hottest titles very well. My Celeron 300 MHz rig runs titles even better, and my fastest machine is a P III 550 MHz, which has no problem at all with any titles, even at the highest detail settings.

A Celeron 300 MHz or faster is a really good CPU for gaming. Most of the entry-level systems today are equipped with Celeron 366 MHz-433 MHz processors, which are more than fast enough for gaming when combined with a quality 3-D graphics accelerator card and the right amount of system RAM.

If you're on a budget and shopping for a complete system, let me suggest getting no less than a 366 MHz Intel Celeron CPU, first and foremost. The competition from AMD is really strong these days and works quite well for these applications, but when it comes to raw horsepower and affordability, the Celeron comes out on top as the best bang-for-the-buck CPU.

And please, whatever you do, steer very clear from any machine with a Cyrix CPU in it! Trust me on this, as there have always been compatibility issues with Cyrix processors and certain titles. When it comes down to it, they may be able to run business applications as fast as an Intel CPU in the propaganda they peddle, but Falcon 4.0 and MS Word are two very different kinds of applications. When it comes to gaming, the Celeron is the wisest choice for the budget-minded shopper.

If you look around, you might be able to find an excellent deal on one of those PCs they offer you for almost nothing if you sign up for Internet service for three years. Most services like MSN or CompuServe offer what they call instant $400-$500 rebates, which help a lot when the PC you want is $700-$900 or more.

When you have found a PC even cheaper, sometimes you can get it for almost no money at all. These are legitimate deals too, but just make certain the Internet service provider has a toll-free phone number for you to log into, as it would not do you much good to pay $20 for Internet access that requires a toll call.

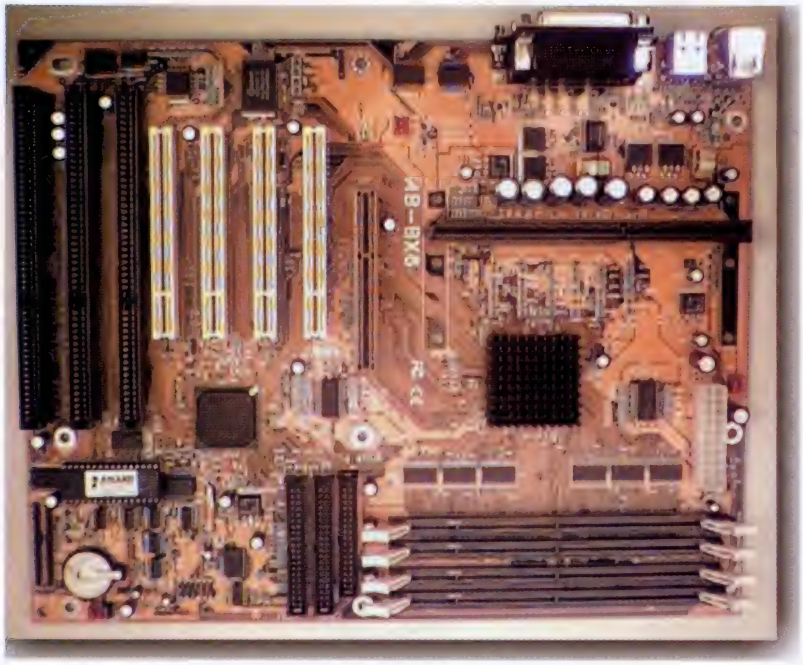
Think of it this way, too—chances are that you already have Internet access, and if you do it's not hard to drop one access provider and go with another. If you don't presently have Internet access, you should get it. I have a hard time seeing anyone be without it today, especially if you're a gaming enthusiast. All the patches and updates you need for your PC and games are there on the Internet. Free multiplayer gaming over the Internet is well worth the monthly service fee. To learn more about these almost free PCs, check with Best Buy, Circuit City and the other major super stores in your area that offer these deals in the Sunday paper pullouts.

## *Sometimes a "bargain" is no bargain at all— Upgrading your present system*

The bargain basement PC is not always the best option. If you already have many newer peripherals, like:

- Newer 56k modem
- 32x or faster CD-ROM drive
- System RAM in the form of PC 66 or PC 100 MHz SDRAM DIMMS
- 6.4 GB or larger Ultra DMA hard drive
- Decent AGP 2x video card
- 17-inch or larger monitor

then you may want to consider just picking up a new motherboard and CPU.




Many PC owners fear doing much of anything inside the case, but a motherboard and CPU transplant isn't as tough as it sounds. If you're not afraid to get inside your PC, this is the most affordable upgrade option to consider, which yields the largest performance improvement. You may also find a "mom and pop" computer retailer, which makes part of its business performing these system upgrades for you.

I would suggest an Abit BX6 2.0 motherboard if you're considering a Slot-1 CPU option, like the earlier Celeron CPUs, or the Abit BM6 motherboard if you plan to purchase the newer Socket 370 variety of the Celeron CPU.

Many of these newer motherboards also offer the ability to set up the CPU parameters from the system BIOS at boot-up, so it's not as hard to install a CPU as it was just a few years ago when setting dip-switches and jumpers was the standard way of doing things. This new jumperless design is trouble free and so easy that a kid can do it. Most

of these new motherboards cost around or under $100. A Slot 1 Celeron 400 MHz CPU can be picked up for well under $100 if you shop around.

A PPGA (which is what they call the newer Socket 370 variety) 433 MHz CPU is even cheaper than the Slot-1 variety. If you already have system RAM in the form of DIMMs, a fast Ultra DMA hard drive, an AGP graphics card and a decent CD-ROM drive, you probably don't need much more than a motherboard and CPU to upgrade to a faster rig. You might want to consider a larger case, and most good ones will only set you back $50-$75, many of which also include a new power supply.

## Your system RAM and video card

Aside from a whole new computer or a CPU/Motherboard transplant, I also suggest adding more system RAM and a new AGP 3-D graphics accelerator card to your system, if you're already running a PII-class machine or faster.

Today, 64 MB of SDRAM is a starting point for decent system performance. Many of the games and simulations out there today will take advantage of up to 128 MB of memory, so if you are at least running with 64 MB you should be OK. However, if you have 64 MB of RAM right now, you should seriously consider adding another 64 MB. More than 128 MB doesn't improve performance that much. But in another year or so I have a notion that 128 MB will be the starting point, so "get as much as you can afford" is usually the best advice I can give in the area of system RAM.

For the budget-minded readers, a Voodoo III 2000 16-MB video card is the best value on the market. Even though it is not truly an AGP card, it does run via the AGP bus. This card gives you the most support, as you can play Direct 3D, 3Dfx Glide and Open GL games and simulations with decent image quality.

Best of all, a Voodoo III 2000 AGP doesn't cost much more than $100 if you shop around. For a few dollars more, I highly recommend a 32 MB TNT2 card, as with it you can Play Direct 3D and Open GL titles, with the advantage of true AGP 2x support (meaning it can dip into system memory for texture storage). They also feature 32-bit color support, which gives you the absolute best image quality. A 32 MB TNT2 AGP card runs about $100-$125 if you shop around. Buying one is well worth the price of admission if you're already running a P II or Celeron 300 MHz or faster system.

## Conclusion

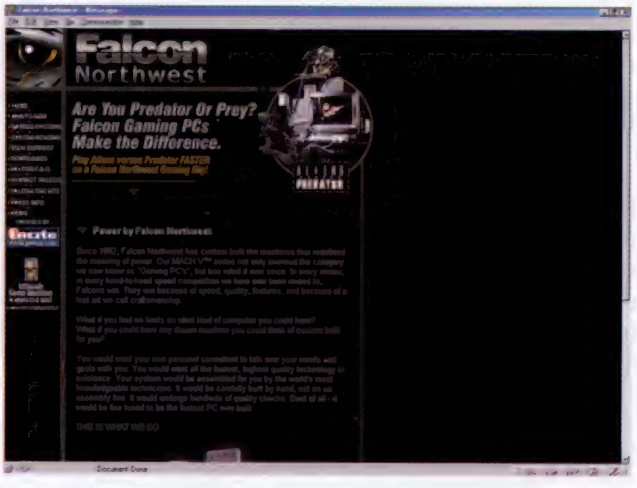
I could go on listing suggestions all day. However, I think I've given you a good starting point and some ideas that can help you on your search for the best upgrade path while on a budget.

I should also mention that the P III 450 MHz CPU is still dropping in price, and if you find a P III-class system in your budgeted price range, definitely don't hesitate to jump on it. Keep in mind that overall, the Intel Celeron 400 MHz or faster is the best option out there today for gaming enthusiasts on a budget.

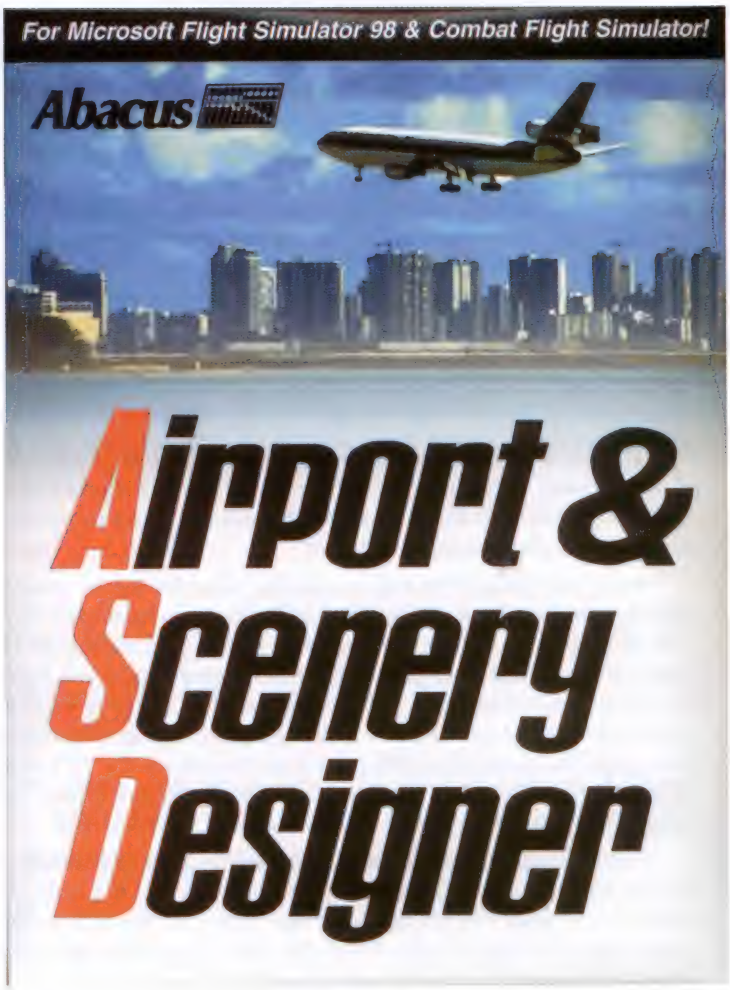
If money is no object, let me suggest giving Alienware PC systems or Falcon Northwest a call. They build the absolute fastest and best PCs for gaming enthusiasts. And, they are fine-tuned for PC gaming. But that's as far as I'll go with that suggestion, as that could be a whole article in itself. But if that's something you'd like us to pursue in a future article, feel free to let us know about it.

If money no object for a new custom system, contact Alienware at http://www.alienware.com/html/index.html or (800) 494-3382.

Another possibility if money isn't a problem is to contact Falcon Northwest Computer Systems at http://www.falcon-nw.com or call (800) 258-6778.



# Airport & Scenery Designer 2.0




The list of existing and soon to be released scenery design programs for *Flight Simulator 98* (FS 98), *Combat Flight Simulator* (CFS) and *Flight Simulator 2000* (FS 2000) is impressive: *Airport & Scenery Designer* v.2.0, *Creatools* 1.0, *Dday* 1.0, *Nova 2000*, *Schiratti Control Center 99* 1.0, and *Visual Object Designer* 3.0. All the different design programs are worth looking into, and a designer can make his/her choice based on design experience and needs. Note that many programs interact with others, the perfect example being *Visual Object Designer* (VOD 3.0), which generates both .api and .scm macro files to be used by *Airport* or *Airport & Scenery Designer* (ASD). One thing is sure: scenery designers now have the tools to create better and more complex scenery.

I remember that Abacus' ASD 1.0 (previously called *Scbuild*) did not get such a hot welcome from European designers. Most of the "self-appointed scenery gurus" believed that it only allowed creating *Flight Simulator* terrain, did not give it a second thought, and kept using MS-DOS designer programs to build airports. It is true that at the time, the airport editor in ASD v.1.0 lacked many functions found in the *Airport* freeware program and in the now defunct commercial program *SYD*, from Apollo. I have to say that with the advent of ASD v.1.1, the very same self-appointed scenery gurus started thinking differently. Not only could they design whole countries faster than you can say "RotatedCall," but they agreed that, although it did not include all the features designers wished for, the airport editor had been much improved.

In a very short time users found that the ASD graphic user interface (GUI) was easier to use than any DOS-based scenery designer. It was also the first program to exploit much of the data found on the Internet, such as data for airports and coastlines. ASD 1.1 became *the* reference.

Now we are at version 2.0 of ASD, and we will take a close look at it.

Phil Pashutine is an independent writer and reviewer. Please note that Full Throttle is owned and operated by Abacus, who is also the publisher of Airport & Scenery Designer.

## Installation

The InstallShield creates several folders for the main program and for textures that are copied to the FS texture folder. The whole program takes less than 60 MB of hard disk space. To preserve disk space, additional maps are found in the CD.

## Manual and documentation

The 180-page manual is one I wish I could see every time I review technical programs. It is comprehensive and well written. If you read it through, you should not have any questions left unanswered. The main sections of the manual are "How to Create Scenery in Map View," "Adding Scenery in Airport View," "The ASD Macro Facility" and "How to Convert Existing Macros to Use the New Macro Facility." There are also chapters on "Creating Elevated Mesh Terrain" and "Working with Textures." Other sections refer to installation, setup, menu commands and installing scenery.

Fifteen FAA Advisory Circulars are also included in .pdf format, with all you need to know to build airport objects according to certain specifications, such as specifications for airport and heliport beacons, signs, pilot-controlled lighting (PCL), visual aids, schematics, runway/taxiway edge lighting system, and heliport design.

ASD v.2.0 uses a new SCASM compiler that adds support for larger memory models and floating-point math. You will find SCASM-related documents in the Scasm folder.

The online help file is well done, but it contains references to programs such as *CoPilot*. You will also find a reference file with thumbnails of the macro objects. I will not go over the extensive body of knowledge that encompasses the design process, as this would require an entire book. The manual explains a great deal of this, and designers Tim Dickens and Justin Tyme have contributed several *Full Throttle* articles on the subject.

## How does ASD work?

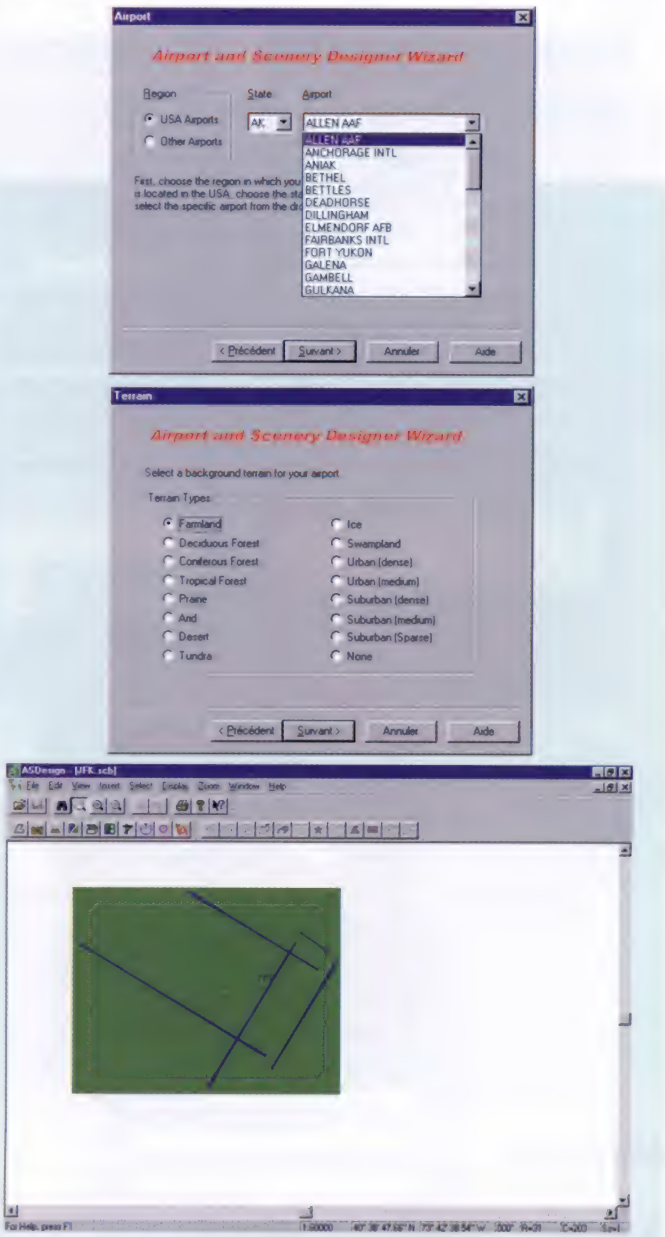
ASD has two editors, the Map Editor and Airport Editor. The Map Editor will allow you to create *Regions*, which is the terminology for rivers, lakes, freeways, highways, roads, islands, cities, railways, coasts or the ubiquitous *Other*. Mountains with single or twin peaks and hard-surfaced mesas (on which you can land your aircraft) can also be created. You can place coastline polygons using the tile grid, include 3-D object macros, and apply synthetic ground tiles (they now display their elevation), airports, navaids and exclude areas.

Use Airport View to create infrastructures such as runways, taxiways, ILS and their markers, buildings, hangars, fuel boxes, beacons and lights, lines, polygons, predefined or custom runway signs, windsocks and helicopter landing zones. You may rotate the whole screen in Airport View when placing objects, runways or lines, so that they are perfectly aligned with the runways or other reference point.

## The Airport Wizard

Before moving on to the Map and Airport Views, let's look at the airport wizard. While it is not a true innovation, it is a utility used by many and is a definite time saver when creating a new airport. This is your only alternative if you cannot download or find the necessary airport data from the Internet. Choose an airport in the USA or many other areas of the world, choose an underlying airport texture and *presto*—instant runways! The generated .scb (map) file can be loaded in the Map Editor or appended to an existing map.

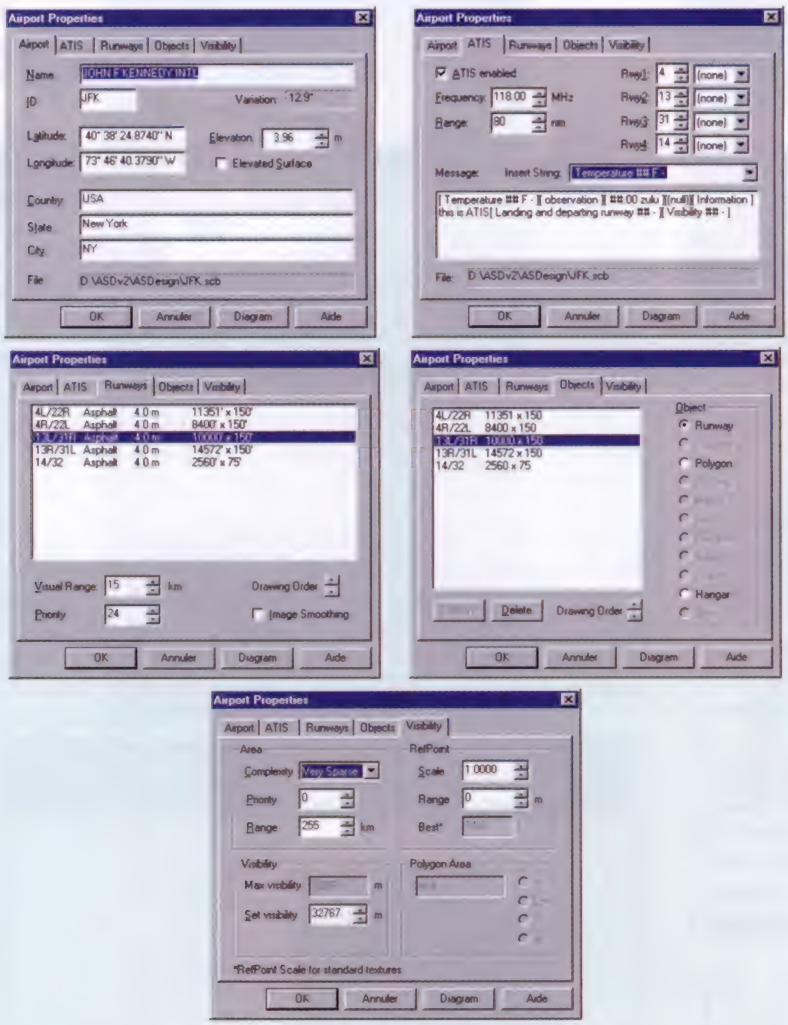
The wizard uses data from The National Geodetic Survey (NGS) in Universal Data Delivery Format (UDDF) that consist of runway, navaid and obstruction data. You can download new airport additions and append them directly in your current project. For the time being, ASD can only extract runway data, and I wish that at some later stage it will import the obstruction data, replacing key words in the file such as "building," "tower" or "mast" with generic objects. Obstructions are an important part of any airport.




*Three examples of using the Airport Wizard*

Highly detailed work on your airport is accomplished in Airport View. The airport's property window contains several tabs for viewing basic airport information, enabling ATIS and inserting text or character strings, assigning a drawing order for each runway and for all other objects. The *Visibility* tab on each airport's property page allows you to set default scenery complexity level, visibility ranges, layering priority and scale factors for all objects. These settings can be changed for each object as desired. A new feature is that airports can now be elevated to any specific altitude.

This is pretty useful when you create an airport on top of mesh terrain, and it is a must for creating airports for FS 2000 and *Combat Flight Simulator*. The airport will be at the determined altitude and the whole airport polygon will be a hard surface.




*The ASD Airport Properties dialog box*

## Map View

Map View is your main working environment. This is where you build a whole area/country from scratch or modify existing scenery files.

If you create from scratch, you need to load a map file and work your way up to include geographical features, navaids, airports and 3-D object macros. If you modify existing scenery, you can load the appropriate map and .bgl scenery files for that area (see below) to see what is in the scenery files on the ASD display.

You can filter object types to un-clutter your display, if you like. You can choose to display one or several elements, like showing rivers only when you need edit them. You can do very precise point editing, which is handy when relocating a road or a river that crosses your airport perimeter or to adjust a coastline so your runway doesn't end up in the water. Map elements can also be edited in Airport View.

*The ASD map tools*

## Loading ASD-compatible maps

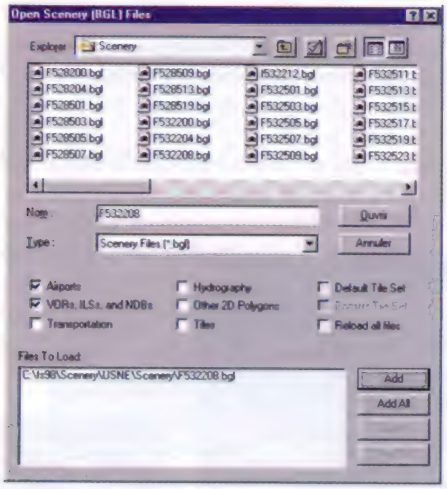
ASD incorporates powerful map functions not found in other programs. You can append maps of various formats (.map, .txt, .dat, .scb and UDDF), export a map to a *CoPilot* format, or import a map (.txt, .dat, .scb formats).

If the scale maps supplied on the CD are not enough, if you require a smaller area or need higher resolution coastlines, you can download data from the US Geological Survey (USGS) Coastline extractor.

ASD 2.0 ships with 63 maps (covering US, Canada, Central America, Caribbean, Australia, Japan, Korea, European continent, Azores and Africa). The US maps already have hydrography and transportation features. Designers will appreciate the "ready made" maps and can concentrate on enhancing their area of choice. If you wish to create your own US map, go to ftp://edcftp.cr.usgs.gov/pub/data/DLG/2M/AL/ to download specific data for boundaries, hydrography, transportation, man made features, etc. ASD comes with specific tools to extract the data and import it into the map. The remaining maps do not have any geological objects (rivers, roads, lakes), since no data source exists for anything outside the US. You can still build this detail from scratch or import default FS or third-party scenery objects.

## Loading existing scenery files

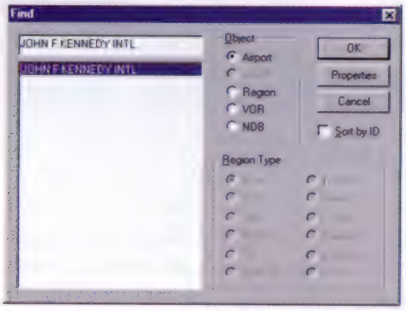
Assuming you want to add to current FS scenery, you can load any .bgl scenery files and display or import them. Scenery features like navaids, airports, transportation, hydrography, tiles (current scenery, default or booster tile set) and other 2-D polygons (coasts, mountains, terrain, cities) may be viewed and imported, if desired.




*You can view or import existing scenery in your ASD map*

## The Find function

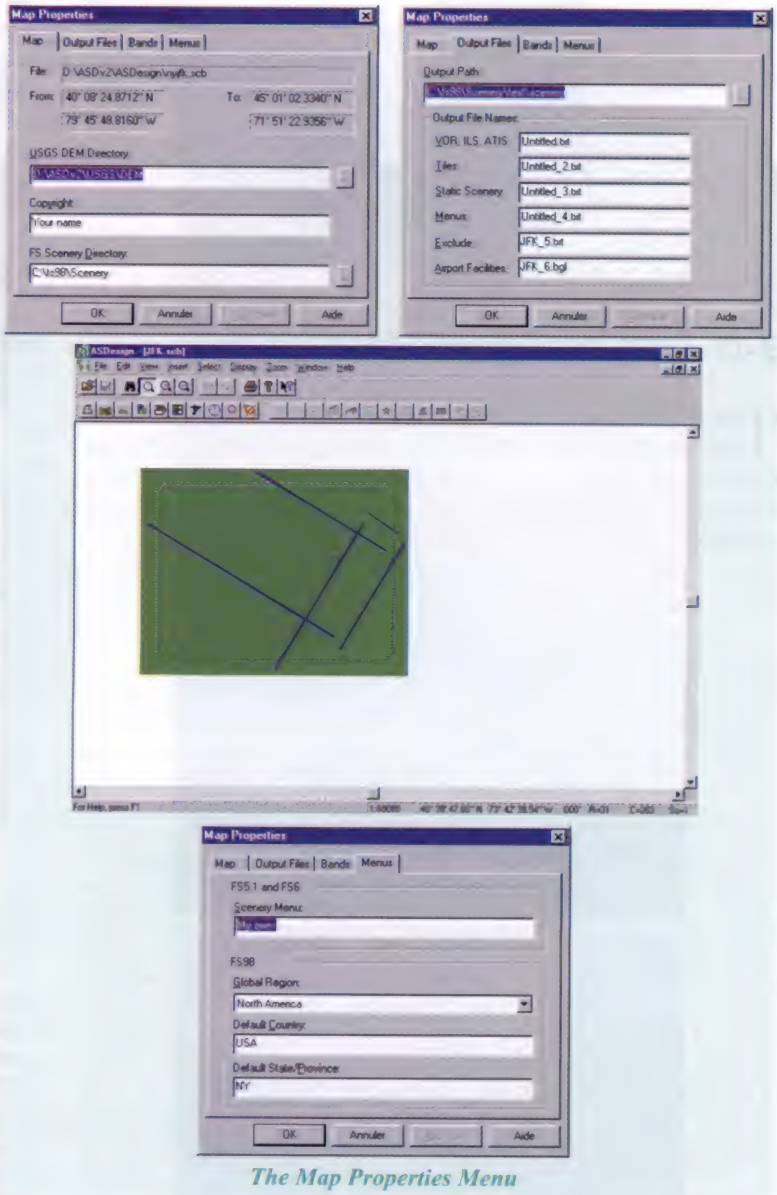
If your scenery includes many airports, navaids or geographical objects, the Find feature will help you locate a specific item. You may then go to its location, access the property window for that element or import it into the map. The Find feature is one all designers greatly appreciate, because when you have some 1,000 entries for airports and object types, locating what you want is like looking for a needle in a haystack. Specific geographical objects can be given a unique name, which will show up in the Find menu.




*The ASD Find menu*

## Map properties

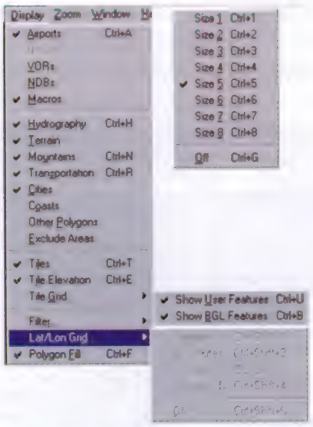
Before you save your work, you will need to set the Map Properties. Include the path where the compiled source and .bgl file will be copied, the output file names, the path for USGS elevation data (DEM), menu entries for *Flight Simulator*'s **World | Go To Airport** option and for the Airport Facility Directory (AFD). Scenery banding, which specifies latitude and longitude areas to be compiled, is also accomplished via the Map Properties menu. Since FS scenery files should really not encompass more than two degrees of latitude, and there is no sense in compiling areas you are not working in, this becomes a very useful feature. The banding option allows you to "slice" your scenery into latitude bands and optimize the scenery loading process. Both your CPU and the end-users will thank you for that.




*The Map Properties Menu*

## The Display menu

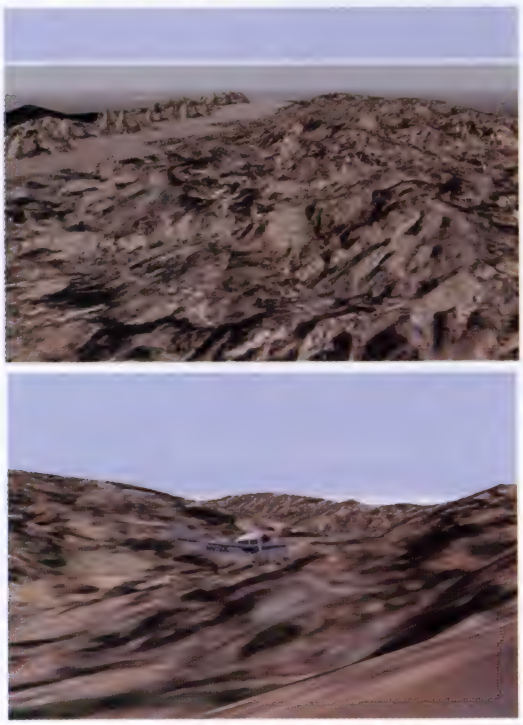
The **Display** menu is the design control center. You can display lat/long and synthetic tile grids, show or hide object types and user terrain elements, etc.




*The map feature display menu*

## 3-D elevated mesh terrain

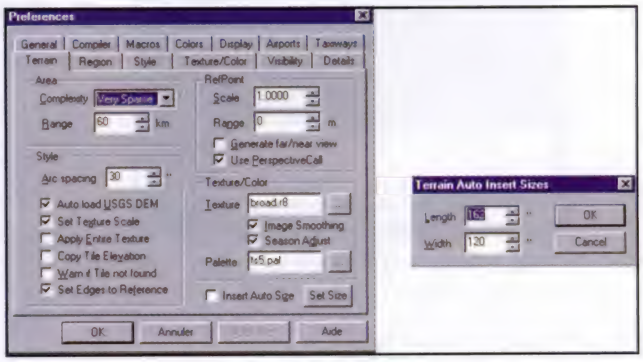
The Digital Elevated Terrain tool (elevated mesh terrain) is the premier feature of ASD 2.0. All designers have wanted an easy way to create elevated mesh terrain for a long time. Imagine true real-world elevation in FS 98, with rolling hillsides and real mountains, with no more pyramid-like mountain peaks.



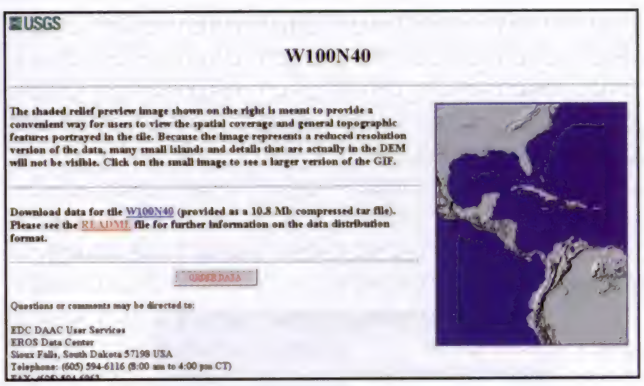
*Elevated mesh terrain in FS 98*

Using it is as simple as laying coastline polygons. Click on the terrain tool icon, drag and size (based on a tile 6 grid), texture the terrain "tile" as you would any other polygon and *voilà*—the terrain for that area will have real-world altitude points. How is that possible?

When you lay the terrain tile, ASD will automatically import the elevation data for that area, providing you have downloaded the correct data file from the USGS. There are two types of data available. One arc-second .dem files for the continental United States, Hawaii and most of Alaska (over 100 elevation points per square mile) or 30 arc-seconds .dem for the rest of the world, with 18 elevation points per square mile (GTOPO 30).




*Terrain tool menus*


USGS
W100N40
The shaded relief preview image shown on the right is meant to provide a convenient way for users to view the spatial coverage and general topographic features portrayed in the tile. Because the image represents a reduced resolution version of the data, many small islands and details that are actually in the DEM will not be visible. Click on the small image to see a larger version of the GIF.
Download data for tile W100N40 (provided as a 10.8 Mb compressed tar file). Please see the README file for further information on the data distribution format.
Questions or comments may be directed to:
EDC DAAC User Services
EROS Data Center
Sioux Falls, South Dakota 57198 USA
Telephone: (605) 594-6116 (8:00 am to 4:00 pm CT)

*The USGS GTOPO 30 data download page*

Now there is a price to pay for mesh terrain: you will need a lot of disk space for the data files! I kid you not. If you were to do the whole of the Hawaiian Islands, the total one arc-second file size required to build the mesh terrain is 67 MB (one arc-second files are about 9 MB each). When using 30 arc-seconds data (GTOPO 30), the smallest file to download is 87 K and the largest is 26 MB. I can see that some are already smiling! But it's not over yet: each file is a .gz compressed file, and inside is an 86 MB .tar compressed file containing all the needed files, including a 57 MB .dem file. So think ahead in term of disk space.

I will not get into the technicalities of building mesh terrain and will direct you to the excellent article on page 42 of the June/July issue of *Full Throttle*. The only drawback to using USGS data is that it does not always agree with the data from their own coastline extractor. Sometimes you will need to re-shape coastlines to avoid your beach being 400 feet in the air.

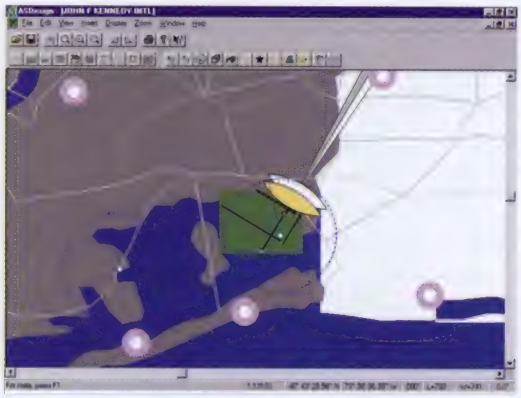
The ASD terrain tool can assign either type of *perspective* attributes to all or individual terrain tiles. This makes it possible to eliminate bleed-through problems with other scenery elements.

## Airport View

Airport View is used to create airport details, such as runways, taxiways and hangars or other 3-D objects. ASD 1.1 users will notice that two new tools have been added: the windsock (with an 8-ft or 12-ft cone) and the adjustable heliport with night lighting.

*The Airport View toolbar*

You can display Map View features in Airport View as well. The important element of any scenery is the runway, but having been accurately positioned, it should never be relocated to accommodate other scenery objects. So if any Map features are in the way, you can edit specific points to move the whole object or delete it.

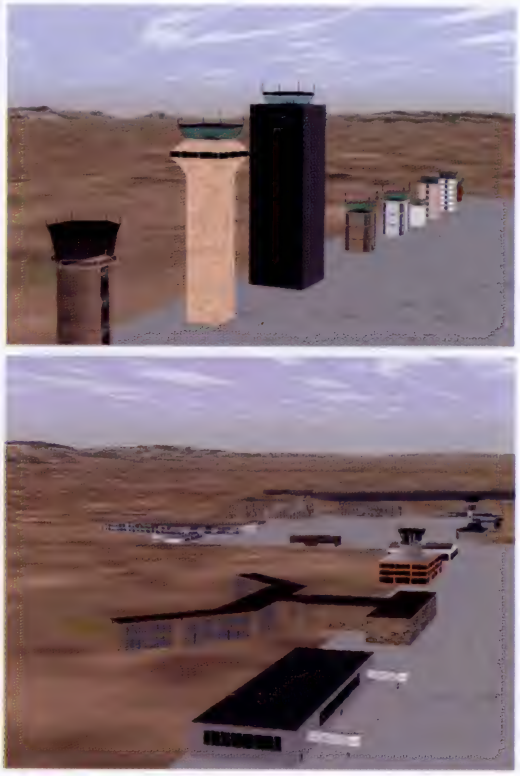


*Features normally seen in Map View can be displayed and modified in Airport View as well*

Now I have more good news for you. ASD v. 1.1 users will recall how the Line tool could only draw a two-point line, which made it difficult to use for some special purposes, such as taxiway markings. Many people requested a multi-point line, and ASD v.2.0 provides it. You can now create the yellow taxiway path lines. The line type can be dotted, dashed or solid and supports day and night colors (variable and constant intensity). Another important point is that pilot-controlled lighting (PCL) is available as well. Specify the frequency on the lighting tab of the runway's properties dialog, and the lights will come on only when that COM frequency is selected in FS.

## Macros

Designers with no knowledge of SCASM programming or those in a hurry had to make do with the 29 object macros that came with ASD v.1.1. ASD v.2.0 still has the original ASD macros, plus 211 new macros.



*ASD ships with 211 custom made macro objects*

Macros can be inserted into both Map and Airport Views. A new enhancement is that they can be selected from The Macro Facility dialog box, which has preset category tabs, like bridges, ships, terminals, trees, etc. If you need to create additional categories, you can do so by editing the macrotabs.txt file, which will accept up to 20 categories. The v.1.1 macros remain in the ASDV2.0\Scasm\Macro folder, as they were in version 1.1. These macros will show in the *Other* tab of the Macro facility dialog box, provided that you copied your macros into the ASD v.2.0 directory (from ASD v.1.1) and your v.1.1 macro.txt file, located in the ASDV2.0\Asdesign folder. *Make certain you copy these files over before deleting an older version of ASD!*

The new macros for the Macro facility menu need not be listed in the macro.txt file. A special macro header was created and is placed at the top of each macro file. The ASD macro dialog box reads the macro header and lists the macro in the appropriate category. Instructions on how to construct this header file is well detailed in the manual.

In ASD Map View, macros are displayed as scaled rectangle icons that change in size to coincide with the scale factor selected on the object's *Visibility* tab. When you place a macro, it will expand graphically to show the area it will cover in the scenery. You don't have to guess if the house will overlay the grass or if the bushes will end on the runway.

By default the macros show a north heading, and they can be rotated with the mouse to another heading. The macros can be moved with the mouse in both Airport and Map Views, however, you can only cut/copy/paste in the Airport View.

*Macro objects are displayed as scaled icons, and may be rotated by mouse*

## Memory

With the many new features and the ability to create mesh terrain, I wondered about the frame rate and memory management in general. There's no sense in creating awesome scenery with outstanding 3-D objects if you get one frame per second performance! Since the scenery memory buffer limit has increased in FS 98, some designers set out to create nice, but memory hog, objects, such as static aircraft. ASD v.2.0 includes an Area Max option (in the preferences) that can be set to 32 or 64K. This tells SCASM where to set the memory buffer for individual objects.

## Is ASD FS 2000 compatible?

I suggest you read Tim Dickens' article titled "Making FS 2000 Scenery Using Current Design Tools" in this issue. All visual (section 9) elements, including airports, polygons, taxiways, runways and 3-D objects can be placed into FS 2000 scenery.

## Conclusion

ASD still ranks as number one among the scenery designer programs. The GUI is very user friendly and allows you to easily create scenery for entire countries, modify existing third-party scenery, use the wizard to automatically create airports, add a variety of objects, etc. Many features were enhanced, but the true innovation for version 2.0 is the ability to create elevated mesh terrain from USGS DEM data. Novice designers will, after a short adaptation period, find that it is an indispensable design tool.

### For More Information

Airport & Scenery Designer

Author: Peter Jacobson
Custom macros: Tim Dickens
SCASM compiler: Manfred Moldenhauer

Abacus
5370 52nd Street SE
Grand Rapids, MI 49512
(800) 451-4319
(616) 698-0330 (voice)
Internet: www.abacuspub.com

Suggested retail price: $79.95
(upgrade available for $33.50 for v.1.0 and v.1.1 registered users)

### Where to get?

Map data:
Coastline Extractor:
http://crusty.er.usgs.gov/coast/getcoast.html
USGS elevation data:
One-arc second:
http://edcwww.cr.usgs.gov/glis/hyper/guide/1_dgr_demfig/index1m.html
30-arc seconds:
http://edcwww.cr.usgs.gov/landdaac/gtopo30/gtopo30.html

# Product Reviews

## Reviewed In This Issue Are:


Grand Canyon (pg 87)
VIP Classic Airliners (pg 89)
Freespace 2 (pg 92)
Combat Pilot No. 1 (pg 95)
Jane's USAF (pg 97)

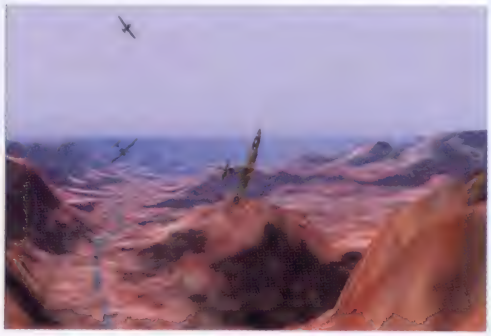

## Grand Canyon

### By Brian Howard

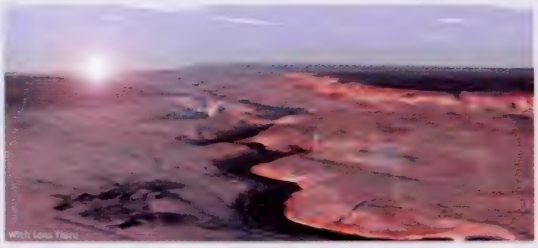
Stretching 277 miles long, averaging ten miles wide and one mile deep, the Grand Canyon is widely recognized as one of our world's greatest natural wonders. Standing on its rim, one discovers a spectacular vista painted in reds, oranges, browns and greens. Although hundreds of thousands of people visit the Grand Canyon every year, most of them must travel great distances for the pleasure. Wilco Publishing's **Grand Canyon** add-on for Microsoft's *Flight Simulator* and *Combat Flight Simulator* makes the Grand Canyon's beauty much more accessible to everyone who enjoys flight simulation.

Wilco's *Grand Canyon* package provides everything you'll need to virtually explore the geologic treasure of the Southwest United States. This add-on's centerpiece is the meticulously detailed 12,000 square miles of Grand Canyon scenery, including eight "photo-realistic" airports. To explore this scenery, *Grand Canyon* provides four new aircraft: Cessna 206 Stationair, de Havilland Twin Otter, Spitfire Mk Vb and Bell 430 Textron helicopter. The aircraft and scenery are compatible with both *Flight Simulator* and *Combat Flight Simulator*. Pilots eager for more realism and challenge will enjoy the five original FS adventures and three CFS missions. The large, fold-out sectional aeronautical chart and VFR aeronautical chart are reproduced in color on heavy weight paper. These charts provide you with a bird's eye view of the Grand Canyon area, plus useful frequencies and other navigational aids. The black-and-white manual provides useful and interesting information about the Grand Canyon, the new aircraft and the adventures. It also includes panels and airport diagrams and approach plates for each of the new airports in the Grand Canyon scenery.

President Roosevelt designated the Grand Canyon as a nature reserve in 1919. One mile below its rim, more than 15,000 people raft the Colorado River each year. Over a century, this river will deepen the canyon by an inch, and erosion will wear the canyon walls, making it 10 inches wider over the same period. The scenery designers working with Wilco have realistically rendered the canyon's features and facilities for both *Flight Simulator* and *Combat Flight Simulator*. I haven't seen the



*Examples of aircraft and scenery you'll experience in Grand Canyon Scenery*



canyon in person since I was a child, but flying over and through Wilco's virtual Grand Canyon returned its sense of majesty to me, and now I'm figuring how I might make my way back to the real thing. When I'm flying deep into Marble Canyon or lining up for final approach at Flagstaff, the scenery portrays a sense of being there. The airports are well populated with computer-controlled aircraft coming and going, and they offer all the facilities you'll expect or need. Even bridges spanning minor canyons are recreated, right down to a bungie jumper bobbing at the end of his tether. Generally, the scenery is pretty good. However, some bleed through is evident, and I noticed some buildings that defied laws of physics. Placed too near the canyon's edge, several buildings are hanging in space, daring gravity to pull them straight to the canyon's bottom. Visually, the scenery appears just as well in FS and CFS.

Most of the aircraft selected for *Grand Canyon* are well chosen. The single-engine Cessna Stationair, the de Havilland Twin Otter and the Bell Textron 430 helicopter are precisely the type of tourist-oriented aircraft you will see buzzing the Grand Canyon. They offer excellent low-speed performance so sight-seers can get a good look. The Stationair's and Twin Otter's high-wing design provides unimpeded views down into the canyon's depths. The helicopter is available in two flight models. If the normal, more realistic helicopter flight model proves too challenging, you may use the simplified version, which uses the LearJet flight model to make piloting the helicopter easier. The Spitfire Mk Vb in USAF livery is a nod toward combat simmers, but seems out of place here. However, I won't argue with adding another plane to my virtual fleet. All the aircraft feature custom instrument panels and sounds, plus moving control surfaces. *Grand Canyon*'s multi-lingual installation program places the four aircraft into both FS and CFS. However, the civilian aircraft don't have unique CFS damage profiles, so firing the guns causes bullets to erupt from empty space well beneath the aircraft's wings. But if realism is your concern, you won't be flying the Twin Otter in combat situations anyway.

If you want to do more than just buzz around the canyon, you'll want to try the five adventures provided for *Flight Simulator*. The first is a VFR flight from Las Vegas to Grand Canyon airport aboard the Cessna Stationair, subjecting you to rigorous control of Class B airspace. The second puts you in the role of a professional pilot working for a local tourist company. As you pilot the turboprop Twin Otter, your copilot describes the tourist sites below for your passengers. In the last original adventure, you're one of the world's most highly trained babysitters, as you must search the canyon for hikers and other adventurous tourists. Each time you locate a group, radio their position and well-being to headquarters. To successfully complete the adventures, be sure to follow all the directions to the letter. The last two adventures can also be flown in the Bell Textron 430, tallying five total adventures. In each of these, you may handle all the duties or direct your copilot to take an active role, changing frequencies and such. These well-constructed adventures offer challenging diversions to the FS routine.

Three CFS missions let you test your combat abilities in the Grand Canyon. Curiously, none of these use the Spitfire provided in *Grand Canyon*; instead, you'll fly Microsoft's P-51. In these missions, you'll practice formation flying in tight confines, defend the gorge from terrorists in stolen Luftwaffe aircraft and make a leisurely tourist flight to see prominent landmarks.

In *Flight Simulator*, the *Grand Canyon* scenery and aircraft performed well. I received frame rates consistent with other areas of FS. Control of the aircraft seemed smooth and natural. While some minor scenery problems were evident, these didn't detract from the overall experience. I particularly enjoyed dropping the Textron over the canyon's rim and roaring through the technicolor trench. In CFS, *Grand Canyon* didn't fare as well. Granted, most of the aircraft weren't designed for CFS, so I can't quibble with those. And overall, the scenery appeared just as well in CFS as in FS. However, the scenery was not well integrated into CFS's file system. To access the Grand Canyon scenery in CFS, you must enter the exact coordinates; you can not simply select the area in CFS's Airfield list. Having installed and used many CFS add-ons that worked well and intuitively, I can't understand why Wilco forces users to enter the latitude and longitude in order to reach their scenery. Getting into combat was also difficult. Trying to access the Grand Canyon in CFS's Quick Combat also requires one to enter the precise coordinates. And on one computer system, the program tried to place the aircraft on the ground at the Grand Canyon airport, causing an immediate prop strike and stopping the aircraft's engine, making combat more than difficult. Quick Combat in the Grand Canyon worked much better on a second system, but the original problem indicates that the *Grand Canyon* may not smoothly integrate into every system. Considering the out-of-place Spitfire, the poor scenery integration and the lackluster missions, CFS compatibility seems to have been an afterthought. However, dogfighting between the canyon's walls is a real pleasure and a challenge.

Wilco's *Grand Canyon* is a good addition to Microsoft's *Flight Simulator*. The well-rendered scenery portrays the vibrant colors and stunning geology of one of nature's most impressive monuments. The (mostly) well-chosen aircraft handle well and accurately fit the challenging adventures. In FS's spot view, the moving parts (rudders, ailerons, gear, etc.) provide an extra touch of realism. *Grand Canyon* also provides an exciting new combat arena for *Combat Flight Simulator*, though it could have been better integrated. Having been designed for *Flight Simulator*, this add-on provides all you could want and more for FS. The CFS extension is frosting on the cake. If you have fond memories of the Grand Canyon and wish to relive the experience through virtual aviation, or if you've never been and would like an inkling of what the excitement is all about, this is one of the best FS add-on investments you can make.

**For More Information**

Wilco Publishing
P.O. Box 30
1620 Drogenbos, Belgium

www.wilcopub.com
info@wilcopub.com

# VIP Classic Airliners

**By Scott M. Slaughter**

As its name suggests, VIP Classic Airliners features the world's finest airliners from the past. This FS98 add-on lets you fly classic airliners that were popular from early 1940 to 1980. This allows you to pilot the first wave of luxurious airliners to early jet liners

I was very anxious to review VIP Classic Airliners and I was not disappointed. It continues the VIP tradition of presenting a quality product for your money. *VIP Classic Airliners* follows the success of the *VIP Classic Wings* volumes and *VIP Ultimate Classic Wings*. I have reviewed other VIP aircraft before in *Full Throttle* and found the panels to be excellent. When your company name of VIP stands for "Visually Incredible Panels," you better have some incredible panels.

As before, the panels in *VIP Classi Airliners* are indeed excellent (see examples on page 91). Many of the aircraft are also visually impressive. Classic Airliners includes 16 major types of airliners in several variants and liveries of airlines of the era (the total of aircraft you can fly is 200 if you install them all). As you can see in the screen shots on page 90, VIP Classic Airliners has been finely detailed for Flight Simulator 98.

Although all aircraft are ready to fly immediately, none include moving or animiated parts. I have checked the website of the developer and distributor but no word as yet about adding moving parts. However, I was able to use *Aircraft Animator* from Abacus to add moving parts to the planes I tested.

*Examples of the "classic airliners" you'll find in VIP Classic Airliners package include (top row, left to right) Lockheed L-188 Northwest Territorial, The N7443 (c/n 199) Capital Airlines, Boeing 707-121 Pan American; (bottom row, left to right) BAC 1-11 200 Branniff Orange, Boeing 720-025 Eastern Airlines, DH Comet 4c RAF.*

*VIP Classic Airliners* includes the following aircraft types:

BAC 1-11, Boeing 707, Boeing 720, Boeing 727, Boeing 737-200, DeHavilland Comet, Douglas DC-3, Douglas C-47, Douglas DC-4, Douglas C-54, Douglas DC-8, Hawker Siddeley Trident, Lockheed L-188 Electra, Sud Aviation Caravelle, Vickers VC10 and Vickers Viscount.

Again, each of these has several paint schemes or variants, bringing the total number of aircraft to over 200.

Realistic aircraft engine sounds add to the realism of the aircraft's appearance and instrument panels. The aicraft sounds are a notch above many other FS 98 add-ons. Select from prop, turboprop and jet engine sounds (corresponding to the types of aircraft in *Classic Wings*).

## Installation/manual

Installing (and even deleting) extra aircraft, panels and sound files can be a problem for many users. Fortunately, the installation program in *VIP Classic Airliners* virtually installs everything for you. Simply follow the on-screen prompts carefully and you should not have any problem. You may install a single aircraft or install everything at one

*Other examples of "classic airliners" you'll find in VIP Classic Airliners package include (from left to right) Vickers Viscount, HS Trident1C Kuwait Airlines and Douglas DC-8 Flying Tigers.*

*Four examples of the "VIP" panels you'll find in VIP Classic Airliners package include (top row, left to right) Lockheed L-188, VC-10 and Comet 4B. The instrument panel below is from the Vickers Viscount.*

time. Then you can easily activate the new panels and sounds. You can also use the same program if you should wish to uninstall the aircraft.

*VIP Classic Airliners* includes a well written and illustrated 140+ page manual (although it repeats information in several languages). It starts with very helpful hints on installing *Classic Wings* but the truly informative pages cover information on the aircraft. Each aircraft type featured in *Classic Airliners* is explained in separate chapters. They include information on the history and physical characteristics of the aircraft. Even more importantly, the manual also includes very important tips on the instrument panel – something that is often overlooked in other software manuals.

## Details

The aircraft were very responsive to either joystick or keyboard commands. My favorite was the Vickers, an aircraft that never flew for any of the major US airlines. Flying this four engine British built aircraft around Kenya (with East Africa Airlines) or the British Isles (with British Airways) was fun and enjoyable.

This project apparently started as a "Classic Jets" collection but I am very happy they included several popular prop-driven airliners. These include Douglas DC-8, Dogulas DC-4 and Lockheed L-188. They were also very classic airliners and need to be included in a package like this one.

## Conclusion

This is a good combination of classic airliners from props to jets and includes airliners that were never flown by major US carriers. Each aircraft is convincing in quality, detail and flying. The instrument panels are terrific. However, moving and animated parts would have added a great deal to the realism experience...especially for the prop airliners. Again, check with VIP or The Associates for an animated update. Otherwise, Aircraft Animator should do the trick of adding moving parts. A great way of enjoying VIP Classic Airliners is to find some scenery from the era in which you're flying. This will add a tremendous amount of realism to an already great add-on. Seriously consider this program if you want to relive or recreate the days of early and classic airliners

### For More Information

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Barrie, Ontario L4M, 6J5

# Freespace 2

## By Rod White

Space combat simulations have been around for years now. And recently, even more space/flight combat simulations have surfaced. Many of the early space combat simulations like X-Wing, Elite, TIE Fighter and the Wing Commander franchise are the most memorable, but some of the titles released in the past year and a half have raised the bar. More recently, Freespace 2 hit store shelves, which is the latest effort from Interplay and Volition, Inc.

The Volition crew was part of the original Descent development house, Parallax Software. Parallax split a few years back into two development houses, Outrage Entertainment and Volition, Inc. Outrage still concentrates on the Descent franchise, while Volition stepped up to develop next-generation space/flight combat simulations.

Last year's Freespace was a fantastic and very in-depth space combat simulation, and many considered it to be the space combat simulation of the year. Although Freespace combined many of the elements that made the classics such entertaining titles, it was how they put it all together that made it such a memorable product.

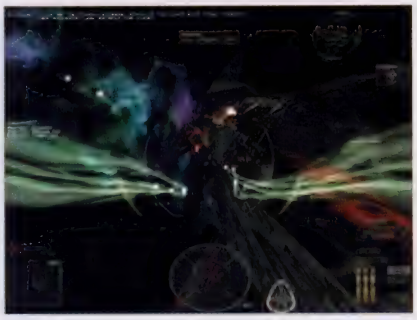
Freespace 2, the sequel to Freespace, takes place about 30 years after the Freespace scenarios. "Descent" is now gone from the title, as Freespace was actually called Descent: Freespace when it debuted last year. Quite frankly, there was really no Descent in Freespace at all; Descent was and still is primarily a sci-fi corridor shooter, which takes place in a spacecraft. Freespace was truly a combat simulation set in space, and with this title no one confuses it for being a new twist on Descent.

## Graphics

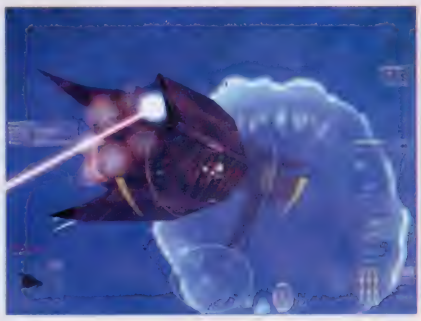
An all-new graphics engine is at work in Freespace 2. While the graphics in Freespace were truly phenomenal, the highest resolution mode offered was 640x480. At 640x480, it offered a level of detail that matched what you could find in Wing Commander: Prophecy (its closest competition at the time), but many complained that they wanted to take it higher, to at least 800x600. I'm glad to report that Freespace 2 breaks the 640x480 barrier, and offers graphics resolutions as high as 1,024x768.

At a glance, Freespace 2 looks very much like Freespace, but a closer look reveals even more graphical splendor. In Freespace 2, nebulae are rendered in painstaking detail, as are the breathtaking space backdrops. But, all this fluff doesn't come without a price. To run Freespace 2 at the highest detail settings, you better have a fast Pentium III-class machine with lots of system RAM and a high-quality 3-D accelerator board (G400, TNT2/Ultra, Voodoo III, etc.).

That's not to say that Freespace 2 can't run nicely on a lower end PII-class system, because it can, but you'll need to bump a few of the detail settings down a few notches.



*(Left) Unleashing a volley of missiles on a huge capital ship. (Middle) Amazingly detailed 1,024x768 32-bit color graphics. (Far right) Massive beam weaponry reaches out to touch an invading foe.*

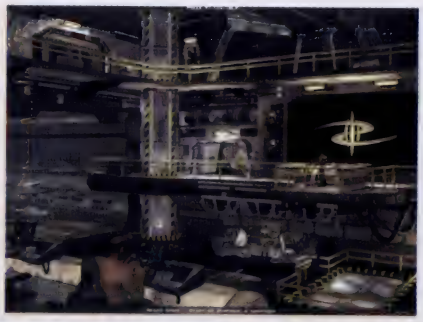


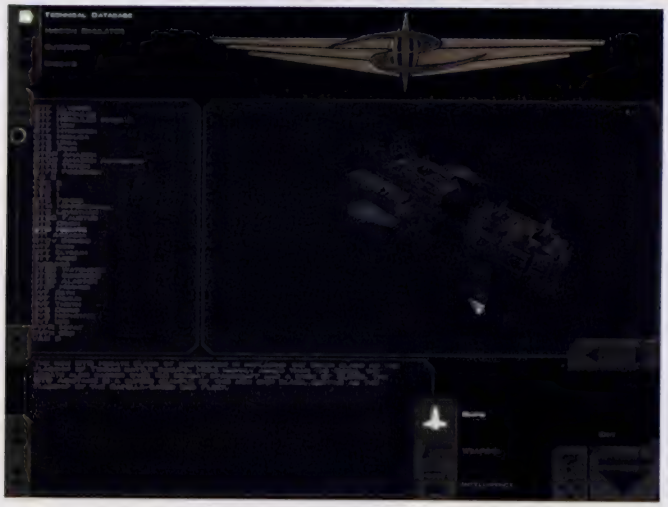
Even then, Freespace 2 still looks much better than its predecessor (even at 640x480). Freespace 2 is the best-looking space combat simulation yet.

## Exceptional audio

Audibly, Freespace 2 has tons of digitized speech, and with it the story unfolds as you play. During each mission you'll hear wingman and other craft chattering, and during a tense space-dogfight the radio chatter gets even thicker, so much so that you can almost forget you're playing a video game.

The audio interaction between the player and the artificial intelligence (AI) ships is just one feature that makes Freespace 2 such an absorbing space combat simulation. Other audio features like the sound effects and music help





*Kicking butt in the Nebula (top left); A very user-friendly graphical interface (top right); and Browsing the Technical Database reveals loads of data on the ships and weapons featured in Freespace 2 (bottom).*

set the stage for each and every mission. The missing briefings and debriefs are also carried out with digitized audio and video cut scenes.

You are in for a real treat if you have an A3D or Sound Blaster Live! Support for other PCI soundcards is also provided. Using four speakers on any soundcard which supports this is amazingly lifelike and helps to draw the player even deeper into the large scale sci-fi space battles they've created for us to take part in, mission after mission.

## Combat missions and campaigns

In space combat simulations of the past, even in the first Freespace, large capital ships were large behemoths, which for the most part just sat there and looked mean. Sure, from time to time a few AI turrets would shoot at you, but they never really felt like much of a threat, as they couldn't really come after you, and at the proper distance you could be free of their weapons range.

In Freespace 2, large hulking ships play a large role in the overall gameplay, as the space battles in Freespace 2 feature a number of large capital ships battling on the screen all at once. For once, large space ships are modeled in a PC space combat simulation just as they have been portrayed in sci-fi TV serials like Babylon 5 and Star Trek: TNG.

One of the first missions you pilot in Freespace 2 features two gigantic space ships, one of which completely annihilates the other with a large-scale beam weapon. From this point on, you tend to have fear and a lot more respect for large-scale ships in Freespace 2, as they're not modeled like capital ships found in any other space combat simulation.

The campaigns and single-player missions are very intense in Freespace 2. The campaign really draws you deep into the game. The story unfolds as you fly each mission, many of the missions feature multiple mission objectives, and on many occasions you can expect a few surprise mid-mission objectives to pop up.

In all, you'll find about 30 missions worth of gameplay, and over 70 new ships and 20 weapons are available to outfit your ships before taking flight. Mission editing tools are also provided, which allow players to create their own new missions and even new campaigns for the game, so re-playability is ensured.

Multiplayer options further add to the overall replay value. The first Freespace suffered from terrible multiplayer support. It never worked very well over the Internet, while it worked great over a LAN. This time I'm glad to report that Internet gaming is smooth and very stable. Up to eight players can compete competitively in head-to-head and team matches. Cooperative multiplayer options are also provided, allowing you and a few buddies to play through the campaign, single missions and user-created scenarios against the enemy AI ships.

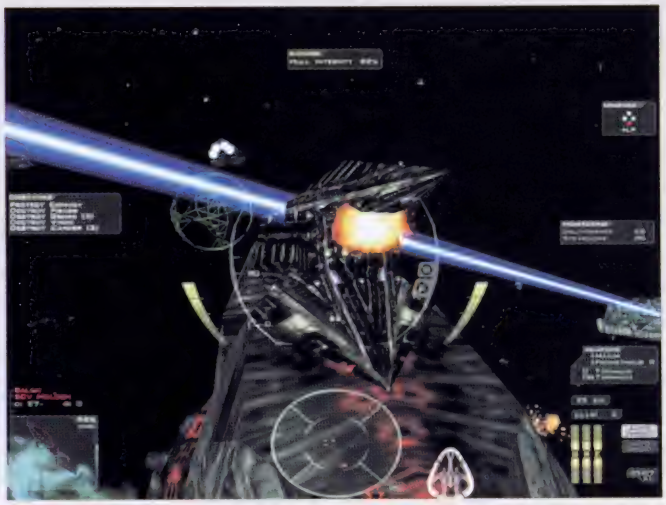
*Now that's a fire!*

## Conclusion

This is by far one of the best space combat simulations to date. Freespace 2 features all of the elements that made Freespace a great game, while bringing many new options and features to the franchise, not to mention great multiplayer support over the Internet, via Volition's Parallax Online free online matchmaking servers.

It's really hard to find anything to criticize in Freespace 2. If you're looking to take part in space battles on a grand scale, this is the space combat simulation to get. With a wide variety of ships and weapons to choose from, large-scale space battles, in-depth missions, briefings and debriefings, spectacular cut scenes, fantastic multiplayer support and capital ships that don't just sit there being pretty—Freespace 2 is clearly space combat simulation of the year material.

***Tons of pilot chatter in-flight helps to reveal the story-line as you play (top left) . Locking on to an enemy ship in the Nebula, and unleashing a devastating blow (top center). More ships warping in during a heated firefight (top right). Fs2-6 Big ships, with big weapons (left and below).***



### For More Information

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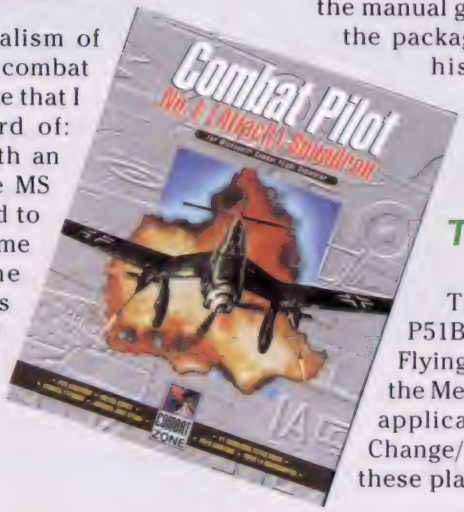
# Combat Pilot No.1 (Attack) Squadron

By Adam Howe

Microsoft has brought the realism of flying and the action of aerial combat together in a truly awesome package that I am sure most of you have heard of: *Combat Flight Simulator* (CFS). With an open architecture like that of the MS flight simulators, we are free to add to and customize the existing CFS game platform. A package from The Associates and Flight Sim Developers called *Combat Pilot No.1 (Attack) Squadron* allows us to add an additional set of unique aircraft to the existing planes in *Combat Flight Simulator*.




Installing *Combat Pilot* was very easy. There is even a little CFS-type video that plays when you insert the CD-ROM for installation. The only difficulty is knowing where your CFS is installed. This is required for installation. If you don't know the proper location and *Combat Pilot* gets installed to the wrong place, the planes will not appear in CFS.

The manual is very helpful in outlining the installation process and giving information on lesser-known CFS features. There is even a section of Pilot's Notes to help you get the most out of your flying experience. The back of the manual gives you a rundown of the different aircraft in the package, including information from the aircraft's history, variants of the design, aircraft specifications and a complete list of the gauges on the instrument panels that are unique to each type of aircraft.

## The Planes

The planes included in *Combat Pilot* include the P51B Mustang, P38 Lightning, Hawker Typhoon, V1 Flying Bomb, Ju 87 Stuka, Piper Grasshopper and the Me 163 Komet, complete with moving parts where applicable. A total 14 planes are added to CFS's Change/Modify Aircraft menu—all different version of these planes.

One rare and interesting feature of these aircraft is that you can actually hear the pilot breathing when you pull a couple of Gs. In other words, when you are diving toward the ground and pull up hard, you hear the pilot breathing through his mask. I had never heard this before and found it to be an interesting addition to the aircraft.

## The Scenery

*Combat Pilot* even includes a small scenery area (one scenery .bgl file) for use with the V1 flying bomb. The scenery as seen here is a V1 launch site that is automatically added to CFS during installation. To get to the scenery, you have to use the Set Exact Location option in CFS, but it is there. A mission would have been nice to get the plane there, but you would still have to take off in a conventional manner—you can't "launch" the rocket. On that same note, I would have liked to see a couple of missions or a campaign showing the new and different aircraft in action, as opposed to just flying around in Free Flight or Quick Combat.

In testing aircraft, I focused on a few things: the handling of the aircraft (flight model), visual appearance (visual model) and the accuracy of the weaponry (damage profiles).

## Flight Model

Even though I am not a pilot, I have flown just about every aircraft available in the flight sims—enough to know what is right and wrong. With each release of a Microsoft flight simulator, changes often enhance the realism of the experience. With these slight changes in *Combat Flight Simulator*, I found the planes in *Combat Pilot* to handle pretty well, considering it was one of the first packages released as an add-on for Microsoft's *Combat Flight Simulator*. I would not give them all a perfect rating, but some of the planes are rather unusual and could be accurate! (How many people do you know who have flown a VI Doodlebug Flying Bomb?) Many of the aircraft seem to float a bit when taking sharp turns and don't seem to want to turn around. This indicates FS98 planes that have been placed in CFS, and not true CFS models. Granted, there is not much of a difference, but it is noticeable.

## Visual Model

The visual models of the aircraft are very good and most impressive. A good way to test the visual model of an aircraft is to look for *bleed through*. Bleed through is when you are looking at the plane from the outside view and you see parts of the plane when you shouldn't. For example, if you are looking at a wing from the side of a plane and you can see the landing gear through the wing. This is almost non-existent in the planes from *Combat Pilot*.

Another good test is to look at the texturing of the aircraft. A good texturing job has all the textures appearing as a solid "skin" on the aircraft, as opposed to being pieced together and showing the seams of the textures where they meet. You will notice the nice job and attention to detail on the texturing of these *Combat Pilot* aircraft.

## Damage Profiles

A damage profile is automatically assigned to every third-party plane that is added to CFS. But creating an accurate custom damage profile for a third-party plane is a very difficult and time-consuming task, as anyone who has attempted to use Microsoft's Damage Profile editor will tell you. A damage profile assigns the armament of the plane: strength of the weaponry, the position of the visual fire flash (or bomb/rocket release) and the armor of the aircraft (how many hits it can take). There is no way to tell how accurate the damage profile is for the armor of the plane; all you can see of the damage profile is the positioning of the gun file. In testing the aircraft in *Combat Pilot*, I can say the armor/damage boxes of the planes seemed to be pretty well created. The positioning of the gun fire on the ends of the aircraft's guns was very close to being visually correct. As you position the view around the planes, you can begin to see the fire flash is just a bit off in some cases—but who flies a dogfight from the outside view anyway? Over all, the damage profiles are very well done.

Overall, *Combat Pilot* is a good, solid package. I would have liked a mission or campaign to put the new and unique planes in their natural settings. This would have added a new level of usefulness and excitement to the package. For those interested in unusual aircraft, this is the package to get. Also, for those who just like to fly a different assortment of aircraft, *Combat Pilot* is for you!

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# Jane's USAF

## By Rod White

For years now, Electronic Arts and Jane's Combat Simulations have brought us great combat simulations that are easy to get into and model multiple combat aircraft. I know many combat simulation enthusiasts who have fond memories of Electronic Arts' *US Navy Fighters* line of products. Then Electronic Arts debuted the Jane's Combat Simulations brand, raising the realism without scaring off novice combat simulation enthusiasts. Working with the Israeli development group Pixel Multimedia, EA next released *Israeli Air Force* (IAF), which featured some of the most realistic terrain graphics ever seen in a flight/combat simulation (outside of that found in the *Flight Unlimited* line of products). IAF was also fairly easy to play while providing realistic flight models, which proved that Jane's had handed the torch to the right group of developers to create the next generation of Jane's Combat Simulations.

***The F-15C Eagle over the Grand Canyon***

After IAF debuted a little over a year ago, Pixel and Jane's wasted no time getting to work on their next project, **Jane's USAF**. This latest product focuses solely on the aircraft flown by the United States Air Force. Jane's also claims that *USAF* was developed in conjunction with the USAF. The all-new graphics engine used in *USAF* builds upon the technology used in IAF, but IAF's shimmering effect when rendering the terrain is gone. Direct 3D drives the 3-D accelerated graphics in *Jane's USAF*, and graphic resolutions as high as 1,600x1,200 are supported in both 16-bit and 32-bit color. I like this a lot, because the 3-D accelerator cards out now, like the G400 and TNT2/TNT2 Ultra, can handle 32-bit color rendering nicely, while still offering decent performance. Even lower resolutions like 640x480 (which is what IAF was limited to) look fantastic in *Jane's USAF*. So, users with lower-end PII-class machines should be able to get by with decent performance, without sacrificing overall image quality.

***Now you can see why they call the F-105 the "Thud."***

Aside from the graphical splendor, *Jane's USAF* also features a fantastic lineup of USAF aircraft to pilot into combat. Debuting for the first time in a modern PC combat simulation is the F-105D/F Thunderchief, or "Thud" as it's more commonly known, which is backed up by the F-4E Phantom II in the Vietnam-era scenarios. In the modern theatre of operations, you can take flight in the F-22 Raptor, F-15C Eagle, F-15E Strike Eagle, A-10 Warthog, F-16C Fighting Falcon and, last but certainly not least, the sleek and sexy F-117A Nighthawk, the ever-so-popular stealth bomber. *Jane's USAF* truly gives players a fantastic arsenal of planes and weapons, which is what really makes it such a fantastic survey combat simulation.

Many new features are also present in *Jane's USAF* that weren't in Pixel's previous release, IAF. They've added many new features to make it more accessible for novice combat simulation enthusiasts, while at the same time allowing for more authentic flight model realism for more seasoned combat simulation veterans. In *USAF*, they debut a new "six degrees of freedom" flight model for more realism. For the greenhorn simulation pilot, an arcade-like chase-mode view is available. When engaged, the player sits behind the aircraft from an external view, with a simplified HUD superimposed over the screen. Better yet, when it comes time for ground pounding, a bull's eye targeting cue appears over the proper spot to drop ordnance. This mode reminds me a lot of how you were forced to play Electronic Arts' *Fighter Pilot*, but thankfully it's an option, not a requirement.

To make things even easier during the missions, an audible "Shoot" or "Drop" cue can also be heard. Now, if you're a hardcore simulation enthusiast, don't let those handholding features scare you. You don't have to use them

unless you want to, because the arcade view can be engaged and disengaged via one of the function keys on the keyboard. As in IAF, the HUDs of the various aircraft share a certain degree of commonality in terms of function, but each of the aircraft is modeled to have the realistic advantages and disadvantages of its unique capabilities. The A-10 and F-117 aren't the ideal air-to-air platforms, while the F-15C is not well suited for ground pounding.

IAF lacked 3-D cockpit art. *Jane's USAF* features gorgeous 2-D cockpit art like IAF, plus impressive, fully functional 3-D cockpit displays. Many of the essential tasks, like locking weapons onto threats and switching through the auto-pilot modes, can also be done by mouse clicking on the appropriate part of the cockpit in both 2-D and 3-D cockpit modes. Many of the commonly known radar modes are also modeled, which include TWS (Track-While Scan), LRS (Long Range Search), ACM (Air Combat Mode), Bore (Boresight) and STT (Single Target Track) for the air-to-air submodes. However, the less experienced combat simulation pilot can enable a "radar cheat" under preferences, which essentially gives the player a continuous 360-degree scan of his surroundings. The air-to-ground submodes include Off (leaving it inactive), Stby (Standby) and GMT (Ground-Moving Target Identification). Additionally the "radar cheat" mode found in the preferences gives you a 360-degree continuous scan of the ground around you.

The scenarios that ship with *Jane's USAF* are great fun to fly. Historical and Future campaign scenarios are included. The Historical scenarios take place in Desert Storm over Iraq and in Vietnam during the controversial Vietnam conflict. Missions in the F-117 to take out the TV station and early warning radar stations in Iraq and dropping napalm in Vietnam flying the Phantom and Thud are downright thrilling in *USAF*. Some of the fictional single missions scenarios are also a hoot—one of them pays tribute to the feature film "Air Force One," as your F-15C Eagle is called to aid Air Force One over Germany by eliminating all the enemy MiGs. The Future missions take place over US soil in Red Flag scenarios in the Nellis AFB/Las Vegas/Grand Canyon region, and the final campaign is a semi-dynamic campaign set in the near future in Germany. Training missions are also part of the package, and mission editing tools top it all off. Creating your own scenarios is a breeze, and you may select from over 300 objects in the editor library. If that's not enough, the Instant Action scenarios quickly get you up in the air and in the thick of things.

***Mid-air refueling can be automated or manual***

***An adversary waiting to get smoked by the USAF's finest***

***The workhorse of the USAF, the F-4E Phantom II over Hanoi***

***The F-22 Raptor over Germany***

Internet support is provided for Janescombat.net, which allows you to hook up and chat with other players from around the world. Once you're ready to play, the Java-based interface launches *USAF* for all players. Options for TCP/IP and IPX are provided for LAN gaming, and overall I'd have to say that *Jane's USAF* is a superb multiplayer combat simulation. Like IAF before it, playing *USAF* over the Internet is smooth and trouble free, even on an average 56k dial-up connection to the Internet. Options are provided to allow players to access the campaign and single missions for cooperative gaming, and a variety of head-to-head or competitive play options are also included, making *Jane's USAF* a very well rounded multiplayer combat simulation for both LAN and Internet gaming.

Jane's World War is another feature promised to debut with *USAF*. It will be a beta test, from which Jane's hopes to create a large-scale, progressive online battlefield. Early talk of World War promised that all future Jane's products would plug into World War scenarios online, but from what we understand, Jane's *F/A-18* won't be one of them, and there hasn't been a lot of talk about Jane's World War lately. The future looks bright for such an effort,

*Superbly detailed 3-D cockpit art.*

*Forward Air Controllers in A-1s even drop smoke, outlining targets for you!*

*The massive B-52 preparing to unleash its lethal payload over Hanoi.*

*The painstakingly detailed 2-D cockpit of the F-4E Phantom II*

and it promises to be the kind of environment in which combat simulation enthusiasts have always dreamed of flying a modern-day combat simulation. Keep your eyes on Janescombat.net for more on World War.

## Conclusion

It's hard to knock such a fine product, especially when it's so darn fun to fly. Without question, the hardcore simulation enthusiast community will find something to harp on in *Jane's USAF*, but don't they always when it's a product designed to appeal to such a wide variety of simulation enthusiasts? I enjoy both hardcore and lightly realistic simulations, and I find that my flight time is being spent more with *USAF* these days than any other combat simulation. Not only does *USAF* present players with a wide variety of planes to fly, it also features a wide variety of AI-controlled support and enemy aircraft. What's more, aside from the planes I mentioned earlier in the article, you can fly the MiG-29 Fulcrum as an adversary in multiplayer missions.

Other neat features include mid-air refueling, and Jane's claims you can issue voice commands to execute keyboard commands via the included Microsoft Speech Recognition program, but unfortunately I've had no luck getting it to work. It's not like I don't have the right hardware either as I have a quality headphone/mic headset that I use a lot online for playing Novalogic Voice-Over-Net combat simulations. The way I see it, the speech recognition stuff is a gimmick, and a stand-alone program like *Game Commander* works much better. The ability to hit Esc at any time during flight to go to the Tactical Display also helps to make every scenario play out as a major operation with multiple missions being flown at once. At any time you can jump to other flights and other planes within each flight to carry out their objectives once you've completed yours. There's a fulfilling sense of taking part in a major operation every time in *USAF*, as opposed to feeling like you're one fighter pilot taking on each scenario alone—something that many of the other simulations on the shelves today fall prey to.

Additionally, USAF tracks your pilots' progress very well, at a level of depth that surpasses what you'll find even in the most hardcore combat simulations on the shelves today. As you complete missions and kill or lose aircraft, every event is logged, and you can even go online and compare your pilots' records with other *Jane's USAF* pilots on the Internet via a special site Jane's has set up.

To sum it up best, you'd be hard pressed to find a more fun-to-fly combat simulation on store shelves than *Jane's USAF*. Featuring superb online multiplayer support, excellent pilot record tracking and promotion features, and offering a wide variety of aircraft and missions spanning the Vietnam era all the way into futuristic what-if scenarios, *Jane's USAF* is truly the combat simulation pilots' simulation, no "if," "and" or "but" about it! It just doesn't get much better than this.

### For More Information

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Redwood City, CA 94065

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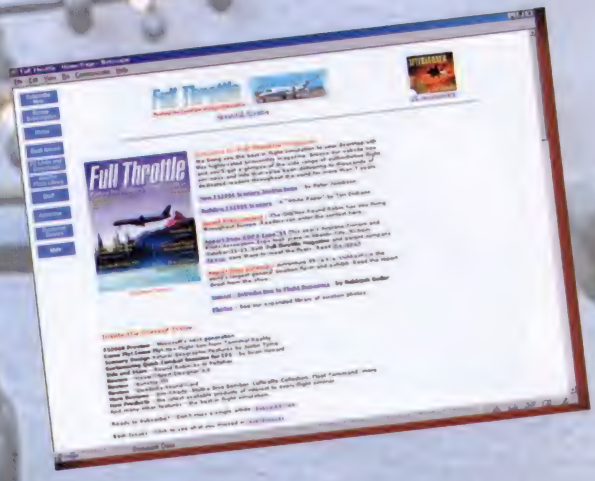


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Santa's FBO's

# Full Throttle Christmas Shopper's Guide

What's Santa going to deliver to flight simmers this season? The following hardware and software can enhance your flight simulation experience. The large variety of items is presented to you by category. Prices listed are the manufacturers' suggested retail prices (MSRP). Manufacturers and their products are listed in alphabetical order.

## Control Yokes

### CH Products Flightsim Yoke PC

Windows 95/98, Win 2000, DOS compatible. ❖ Ergonomic designed yoke movement without a center detent ❖ 3 axis of control including, pitch, roll, and throttle lever. ❖ 14 button functions including, gear switch, flap switch, 4-way hat switch, two 2-way rocker switches, and 3 push buttons. ❖ Software Programmable ❖ Precision trim controls ❖ 7 foot cable ❖ Flight Sim Yoke PC uses a standard PC gameport connector and is supported by all current sim software. ❖ MSRP - $99.95

### CH Products Flightsim Yoke USB

Windows 98, Win 2000, iMac, or Mac with USB port ❖ New ergonomic designed yoke movement without a center detent. ❖ 5 axis of control including, pitch, roll, throttle lever, propeller lever, and mixture lever. ❖ 19 button functions ❖ Software Programmable ❖ Precision trim controls ❖ 7 foot cable ❖ Compatible with Pro Pedals USB or CH Pedals USB ❖ MSRP – To be announced

### CH Products Flightsim Yoke USB LE

Compatible with Win98/Win2000(NT5) iMac\Mac with OS 9.0 and Input sprocket 1.72 or above with USB port. ❖ New ergonomic designed yoke movement without a center detent ❖ 3 axis of control including, pitch, roll, and throttle lever. ❖ 14 button functions, hat switch, two 2-way rocker switches, and 3 push buttons. ❖ Software Programmable ❖ Precision trim controls ❖ 7 foot cable: easy setup. ❖ USB interface ❖ Compatible with USB Pro Pedals . ❖ MSRP - $109.00

### CH Products Virtual Pilot Pro

Two 4-way hat switches ❖ Six single-fire buttons ❖ Precise elevator and trim controls ❖ 7-foot cable ❖ 3 year warranty ❖ MSRP - $75.00

### Precision Flight Controls Cirrus Yoke

Metal casing-powder coated ❖ 2-way rocker switches on each stem ❖ Cessna style throttle control ❖ Real world materials ❖ Available in Mooney (illustrated), Beech KingAir and jet styles ❖ MSRP- $495.00 (Mooney), $545.00 (Beech), $595.00 (Jet)

### Quickshot Pro Wheel Control Yoke

4 fire buttons (A, B, C, D) ❖ 2 dual-speed turbo fire selectors ❖ Rotary throttle control ❖ Detachable accelerating pedal with 8-foot cable ❖ MAX-throttle button ❖ OFF-throttle button ❖ 8-foot cable with 15-pin game port connector ❖ 4 stabilizing suction cups ❖ MSRP - $49.99

### Suncom G-Force Yoke

Four fire buttons ❖ User can switch fire button settings from one handle to the other. ❖ Lock the yoke and it converts to a steering wheel for racing simulation. ❖ Dual mounting methods allow the G-Force Plus to be mounted to a table edge, or 4 super suction cups. ❖ MSRP - $25.00

## Joysticks

### CH Products FORCE FX

Offers six built-in force-feedback effects ❖ F-16 style grip ❖ Two 4-way hat switches ❖ Five siingle fire buttons ❖ Trigger ❖ Trim controls ❖ 7-foot cable ❖ 6 month warranty ❖ MSRP - $89.95

### CH Products F-16 Fighterstick

One 8-way switch, three 4-way switches ❖ Three fire buttons ❖ Trim control ❖ Rotary throttle ❖ Single key macro programming ❖ WINDOWS 95\98 programmable software, point and click graphical user interface (GUI). ❖ MSRP - $99.00

### CH Products F-16 Combatstick

Two 4-way switches ❖ Five fire buttons + trigger ❖ Rotary throttle and trim controls ❖ Weighted base ❖ 7' cable ❖ 3-year warranty ❖ MSRP - $70.00

# Full Throttle Christmas Shopper's Guide

## CH Products Gamestick 3D

Windows 98, Win 2000, iMac, or Mac ❖ Available for either PC or USB ports ❖ 3D Twisting Action Handle ❖ 4 Fire buttons ❖ 4 Way hat switch ❖ 4 Axis of control, including throttle slider and twist Z axis ❖ Precision Trim Controls ❖ USB Software available for USB version ❖ Ambidextrous in design (right or left handed players) ❖ 7 foot cable ❖ Approximate street price $49.95 (either model)

## CH Products CH Flightstick Pro

Three fire buttons + trigger ❖ One 4-way switch ❖ Trim and throttle controls ❖ Weighted base ❖ 7' cable ❖ 3-year warranty ❖ MSRP - $59.00

## Gravis Exterminator

Joystick and proportional D-pad ❖ 49 programmable functions. ❖ 8-way POV switch to instantly change perspective or weapons. ❖ Contoured joystick and hand rest ❖ Game port and USB connectivity ❖ 3-year warranty. ❖ MSRP - $59.95

## Gravis Firebird 2

13 programmable buttons ❖ 8-way programmable hat switch ❖ Assigns macro codes with up to 106 keystrokes to a single button ❖ T-grip rotary throttle and elevator trim adjuster ❖ Contoured pistol grip with hand rest ❖ Adjustable handle tension ❖ Weighted base ❖ MSRP - $89.95

## Gravis Thunderbird Four fire buttons + trigger

4-way CH-compatible hat switch ❖ T-grip rotary throttle and elevator trim control ❖ Contoured handle with comfortable hand rest ❖ Handle tension adjusts independently in 4 directions ❖ MSRP - $59.95

## Logitech WingMan Extreme Digital

100% digital technology ❖ Programmability without using the keyboard ❖ Sculptured grip ❖ Reinforced trigger and hat switch stand ❖ 6 Rubber-coated buttons ❖ Weighted base ❖ Radial throttle system ❖ MSRP – $39.95

## Logitech WingMan Force

Force Feedback capability ❖ 9 programmable buttons. ❖ 8-way hatswitch and throttle wheel. ❖ Custom grip ❖ USB and serial interface. ❖ One year warranty ❖ MSRP – $99.95 ❖

## Logitech WingMan Interceptor

Custom handle grip ❖ Net-2 magnetic encoding technology ❖ Wingman® Profiler™ software ❖ 33 Programmable switches ❖ Precision radial throttle ❖ High-precision radial throttle ❖ Three 8-way hat switches ❖ Nine rubberized programmable buttons ❖ Rapid-fire trigger with two-way switch ❖ MSRP – $59.95

## Microsoft Sidwinder® Precision Pro USB

USB and game port compatibility ❖ Programmable functions ❖ Game Device Profiler software ❖ MSRP - $74.95

## Microsoft Sidwinder® Force Feedback Pro

Force feedback technology with multilayered forces ❖ 16-bit on-stick processor ❖ Adjustable force levels and spring forces ❖ Direct handle-sensing system ❖ Force Feedback RAM ❖ Programmable functions ❖ Game Device Profiler (GDP) software ❖ Digital-optical technology ❖ Continuously correct calibration ❖ New ergonomic design ❖ MSRP - $129.00

## Microsoft SideWinder

Tactile switches ❖ Trigger ❖ MSRP – $34.95

## Quickshot Sky Commander

Adjustable joystick and throttle separation ❖ 10 programmable fire buttons ❖ Programmable HAT for flight simulation games ❖ Programming software for Windows 3.1 and Windows 95 ❖ Weapons select system ❖ HAT and throttle can be programmed to function as joytick or keyboard ❖ Non-volatile memory for storing game setting ❖ Supports both PS/2 and AT keyboards ❖ Weighted base ❖ 8-foot joystick cable ❖ MSRP -$79.95

## Quickshot GenX 700K

Right-handed 3D handle ❖ 4 handle fire buttons ❖ 4 keyboard digital buttons ❖ Rudder (rotational movement) ❖ Multi-view HAT switch ❖ Full-size BioThrottle ❖ Control mode selectors for HAT, Rudder and full-digital mode ❖ Metal weighted base ❖ 7' cable ❖ Keyboard port bypass ❖ 3-year warranty ❖ MSRP- $49.99

## Quickshot GenX 500

Right-handed 3D handle ❖ 4 fire buttons ❖ Rudder (rotational movement) ❖ Multi-view HAT switch ❖ Throttle control ❖ Metal weighted base ❖ Cool, dark metallic blue color ❖ 7' cable ❖ 3-year warranty ❖ MSRP - $34.99

## Quickshot 3D Striker

Rotational 3D handle ❖ Multi-view HAT switch and six (6) fire/action buttons ❖ Full digital control ❖ Thirty-nine (39) function keys ❖ Custom grip design and foam wrist support ❖ Weighted base ❖ No programming required ❖ Connects to PC/AT or PS/2 keyboard ports ❖ MSRP - $49.99

## Saitek SP550

5 buttons and trigger ❖ Slider throttle ❖ 4-way Hat Switch ❖ MSRP - $29.95

## Saitek X36 Combo

Combination of stick, throttle, rudder, mouse control ❖ Three 8-way hat switches ❖ 3-mode control ❖ Pinkie shift switch ❖ 14 digital inputs ❖ Programmability of 276 functions ❖ Rubberized finish ❖ Includes Saitek Gaming Extensions (SGE) Windows® 95/98 compatible software for programming & configuration profiles for popular games. ❖ MSRP - $149.95

## Saitek X36F Flightstick

Fully programmble ❖ High grip finish ❖ 4 Fire buttons ❖ 'Pinkie' switch (can double function of other controls) ❖ 2 x 8 way hat switches ❖ MSRP - $149.95

# Full Throttle Christmas Shopper's Guide

### Saitek X35F Flightstick

4 Fire buttons ❖ 'Pinkie' switch (can double ❖ function of other controls) ❖ 2 x 8 way hat switches ❖ CH Combat stick compatible in default mode ❖ SRP - $69.95

### Saitek Cyborg 3D

Fully hand adjustable for right and left handers ❖ 3D twist function ❖ Ratio digital technology ❖ Up to 24 programmable actions ❖ USB version available ❖ A total of 16 Independent Programmable Buttons ❖ MSRP - $69.95

### Saitek Cyborg 2000

Adjustable for left or right handed players and for hand size. ❖ Trigger ❖ 3 fire buttons ❖ 4 way hatswitch ❖ Lever throttle. ❖ Compatible with DOS, Windows 95/98 ❖ MSRP - $29.95

### SuncomScepter LCD

Touch 'N Go Programming, no software to install ❖ 24 Programmable Buttons ❖ Stores and Remembers up to 480 game commands ❖ Digital / Optical Technology ❖ LCD Readout of programmed functions ❖ Ergonomic Grip ❖ Scepter LCD Fully Featured Controller: ❖ MSRP - $ 55.99

### Suncom F15 Talon

Tactical Control Sticks. Authentic replica of the pilot's hand control grip in the ❖ USAF's premier tactical fighter - the F-15E Strike Eagle. ❖ MSRP – $32.00

### Suncom Flight Controller FC USB

Compatible with PC or iMAC with USB port, Win 98 ❖ 8-way Hat switch ❖ Four Primary Fire Buttons ❖ Fully programmable joystick through Win 98 interface. ❖ MSRP - $25.00

### Thrustmaster F22 Pro

Dual-stage trigger ❖ Heavy gauge spring tension ❖ Glass-filled ABS handle ❖ Powder coated metal base ❖ Four programmable buttons ❖ Four 4-way switches ❖ Metal gimbal mechanism ❖ Programmable in both Digital and Analog ❖ MSRP - $159.95

### Thrustmaster F-16 FLCS™

Analog or Digital operational modes ❖ Authentic military design ❖ Four 4-way switches ❖ Three buttons ❖ Dual stage trigger or Paddle switch ❖ MSRP - $129.95

### Thrustmaster Top Gun© USB

4-Way Hat Switch ❖ Quick Action Trigger ❖ 3 Beveled Buttons ❖ Weighted base stands strong in battle ❖ Neoprene grip ❖ Low resistance boot ❖ MSRP - $39.95

## Rudder Pedals

### CH Products CH Pro Pedals USB

Sliding motion of forward/backward ❖ Heel-toe motion gives differential toe braking control. ❖ Three axes of control ❖ Plane or car simulator control ❖ Seven-foot cable ❖ Three year warranty ❖ USB interface ❖ Heavy base ❖ Expected Ship Date, November 1999 ❖ MSRP - $110.00

### CH Products CH Pro Pedals

Dual mode for aircraft/car ❖ Sliding motion for pedals ❖ Wide pedal spacing ❖ 7' cable ❖ Weighted base ❖ 3 year warranty ❖ MSRP - $83.00

### CH Products CH Pedals

Dual mode for aircraft/car ❖ 7' cable ❖ Weighted base ❖ 3 year warranty ❖ A USB model will be available soon-price not set ❖ MSRP - $50.00 for gameport model

### Precision Flight Controls Cirrus Pedals

Duplicates motion of real-world rudder pedals ❖ Toe brakes ❖ Powder coated aluminum base ❖ MSRP - $395.00

### ControlVision SimHawk Rudder Pedals

Duplicates motion of real-world rudder pedals ❖ Toe brakes ❖ Powder coated steel and aluminum base ❖ For connection to SimHawk control unit only ❖ MSRP - $300.00

### Thrustmaster Elite Rudder Pedals

True fore and aft movement of pedals ❖ Spring loaded pivot action ❖ Extra large weighted base ❖ Wide pedal configuration ❖ Full one-year warranty ❖ MSRP- $79.95

## Throttles

### CH Products CH Pro Throttle

Four 4-way switches and pushbuttons ❖ Sliding action ❖ Left-handed grip ❖ Both analog and digital modes ❖ Added programmability for joystick functions ❖ 3 year warranty ❖ MSRP - $95.00

### Saitek X36T Throttle

4 detent positions ❖ Rudder control (analog or digital*) ❖ Mouse control* plus selector button ❖ 3 position mode switch ❖ Controls available & programmable used with Saitek X36F control stick ❖ MSRP – not available at press time

# Full Throttle Christmas Shopper's Guide

### Saitek X35T Throttle

Rudder control (analog or digital*) ❖ Mouse control* plus selector button ❖ 2nd 3 position digital switch* ❖ 2nd fire button ❖ 2 rotary controls* ❖ Controls available & programmable used with Saitek X36F control stick ❖ MSRP – not available at press time

### Suncom SFS Throttle

Touch 'N Go Programming-no software needed ❖ 16 Programmable buttons. ❖ Program 1 to 5 keystrokes, including Macro's or Chord Keys. ❖ Programmable with any joystick ❖ Multiple hat switches and military style grips. ❖ MSRP - $72.00 ❖

### Thrustmaster F16 TQS Throttle

Replica of real F-16 throttle ❖ Targeting cursor control ❖ Military style design ❖ Two dials ❖ Two 3-position switches ❖ 4-way radio switch ❖ Arced throttle movement ❖ Afterburner & idle detents ❖ Completely user programmable ❖ MSRP - $139.95

### Thrustmaster Attack Throttle

Military style design ❖ Includes programming software ❖ Connects with any joystick and rudders, including analog ❖ 100% digital design ❖ PC gameport compatible ❖ MSRP - $59.95

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## Flight Consoles

### ControlVision SimHawk Pro

Realistic avionics ❖ Tactile avionics tuning ❖ Realistic controls ❖ Powerful amplified stereo speakers ❖ Real operating intercom with dual headset ports ❖ Program selection buttons for multiple software packages. ❖ Compatible with Elite PCATD V5.3 IFR Training software, ❖ Jeppesen Flite Pro IFR Training software, ❖ Microsoft Flight Simulator 98 and 2000, ❖ FLY! by Terminal Reality, ❖ IFT Pro IFR training software ❖ MSRP - $1,395.00

### Precision Flight Controls PAL Panel

Connects through keyboard via "Y" interface ❖ Utilizes high resolution overlays for MS Flight Simulator 98 and many other combat games ❖ MSRP - $149.95

### Quickshot Master Pilot 98 Console

Connect multiple units in a series ❖ Weighted metal stand allows two different operating angles (either 25° or 77° ) ❖ Includes a custom game card for each game with its specific commands ❖ 77 games are pre-programmed on an upgradeable cartridge ❖ Comes with both PS/2 (mini-DIN) & standard 5-pin DIN keyboard connectors ❖ Launch Windows 95 utilities (game card for WIN 95 included) ❖ MSRP - $59.99

### Quickshot Master Pilot Programmer

An accessory for the MasterPilot flight console. ❖ Allows you to program the game setting cartridge with any preferred key sequence. ❖ MSRP - $29.99

### SaitekPCDASH Panel Control Device

PC-compatible ❖ 2x fire buttons ❖ Fully programmable (Over 150 functions) ❖ 8-way thumb pad ❖ 3x function buttons with ❖ Status LEDs ❖ Can be used in conjunction with joysticks or other controllers. ❖ MSRP - $69.95

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## Accessories

### CH Products CH Gamecard 3D

Compatible with all IBM and compatible PCs ❖ Speed Adjustable technology ❖ Automatically adjusts to your computer's speed from 4.77 MHz up to 650+ MHz ❖ Two joystick connectors ❖ Supports 4-axis joysticks, so you can take advantage of ❖ Multi-speed programming-you can set speed manually- with up to 32 programming values ❖ Software included ❖ MSRP – Not available

### Rock'n' Ride

Moves you and your monitor up to 55 degrees in response to input from the joystick control. ❖ MSRP – not available at press time

**See the following page for information on contacting the manufacturers of these fine products**

# Full Throttle Christmas Shopper's Guide

## Manufacturer Information

### CH Products
Phone: (760)598 2518
Web site: http://www.chproducts.com/
E-mail: sales@chproducts.com

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FAX (316) 231-5816
Web site: http://www.controlvision.com
E-mail: sales@controlvision.com

### Gravis
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Web site: http://www.gravis.com/
Email: webmaster@gravis.com

### Logitech Inc.
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Web site: http://www.logitech.com

### Microsoft Corp.
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### Precision Flight Controls Inc.
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# Year-end Index

The following is an index of all the articles, reviews, features and more that have appeared in this year's issues of *Full Throttle*. We've organized the list first by article, subject and Author/Manufacturer/ Publisher.


| Title | Author/Pub./Man. | Issue/Page |
|---|---|---|
| "*Air Command*" | Joe Jaworski | April/May, p. 9 |
| "*Airbus 2000*" | Horizon Software | June/July, p. 12 |
| "*Aircraft Animator*" | Abacus | Aug./Sep., p. 12 |
| "*Aircraft Animator*" | Phil Paschutine | Aug./Sep., p. 80 |
| "*Aircraft Collection 99*" | Scott Slaughter | Aug./Sep., p. 78 |
| "*Aircraft Factory 99*" | Abacus | April/May, p. 13 |
| "*Aircraft Factory 99*" | Phil Paschutine | Aug./Sep., p. 76 |
| "*Airline Simulator 2*" | Interactive Associates | Aug./Sep., p. 8 |
| "*Airport 2000*" | Phil Paschutine | April/May, p. 55 |
| "*Airport & Scenery Designer*" | Phil Paschutine | Dec./Jan., p. 80 |
| "Anderson Fine Scale Replicas" | AFSR | Oct./Nov., p. 10 |
| "*Apache Havoc*" | Rod White | June/July, p. 68 |
| "*Apache Havoc*" | Empire Interactive | June/July, p. 12 |
| "*AutoMETAR*" | Dauntless Software | Dec./Jan., p. 10 |
| "*Aviator Pro 98*" | Scott Slaughter | Aug./Sep., p. 74 |
| "*Basics of Deciphering International METARs without Toil*" | Phil Paschutine | June/July, p. 89 |
| "*Battle for Midway*" | Abacus | June/July, p. 9 |
| "*Blue Sky*" | Iain Murray | Oct./Nov., p. 6 |
| "C&N Reproductions" | C&N Reproductions | Oct./Nov., p. 11 |
| "*Clouds.Zip*" | Michitaka Suzuki | June/July, p. 14 |
| "Cockpit Collection" | Cockpit Collection | June/July, p. 10 |
| "*Combat Expansion Pack*" | Jim Rhoads | Aug./Sep., p. 72 |
| "Combat Flight Sim/Strategy Game" | Infogrames Entertainment | Feb./March, p. 6 |
| "Come *Fly!*, Come *Fly!* away…" | Basil Copeland | Oct./Nov., p. 14 |
| "*Comm1*" | Jim Rhoads | Feb./March, p. 77 |
| "*Comm1 IFR*" | E-publishing | Dec./Jan., p. 10 |
| "*Comm1* Pilot Communications Training" | E-publishing Group | Feb./March, p. 12 |
| "*Concorde SST* Supersonic Transport" | Interactive Magic | Feb./March, p. 16 |
| "*Control 2000* Aircraft Manager" | G.J. Smith | Feb./March, p. 14 |
| "*Course Finder 98*" | Lovette Software | April/May, p. 11 |
| "Create your own CFS Missions" | Chris Steele | Aug./Sep., p. 25 |
| "Customizing your Quick Combat Enemies in CFS" | Brian Howard | Oct./Nov., p. 40 |
| "Dash 80" | Jim Rhoads | Aug./Sep., p. 15 |
| "*Desert Fighters*" | Dynamix | June/July, p. 13 |
| "Desktop Wings" | Desktop Wings | April/May, p. 9 |
| "DeskTop Wings" | Desktop Wings | Dec./Jan., p. 11 |
| "*Dem2Ras*" | Rob Parsons | Dec./Jan., p 7 |
| "*DirectFlight* Combat Expansion Pack" | Horizon Group | Aug./Sep., p. 10 |
| "*Dynamic Object Libraries*" | Abacus | Feb./March, p. 14 |
| "*EFIS98: Electronic Flight Instrumentation System*" | Papa Tango | Feb./March, p. 11 |
| "Elite" | Aviation Teachware Tech. | Oct./Nov., p. 13 |
| "Elite Electronic IFR Training Environment" | Jim Rhoads | Feb./March, p. 47 |
| "*European Air War*" | Rod White | Feb./March, p. 58 |
| "Everything you Wanted to Know about Elevated Mesh Terrain for MS *Flight Simulator*" | Tim Dickens | June/July, p. 42 |
| "Exploding Objects in Microsoft *Combat Flight Simulator*" | Konstantin Kukushkin | April/May, p. 15 |
| "*Fighter Squadron: Screamin' Demons over Europe*" | Rod White | April/May, p. 66 |
| "*Flanker* 2.0" | Mindscape | Dec./Jan., p. 13 |
| "*Fleet Command*" | Scott Slaughter | Oct./Nov., p. 82 |
| "*Flight Director 99*" | Flight One Software | Aug./Sep., p. 63 |
| "*Flight Management System II*" | HabakukSoft | Oct./Nov., p. 8 |
| "Flight Sim Yoke (PC version)" | Tim Dickens | June/July, p. 79 |
| "*Flight Simulator 2000*" | Microsoft | Oct./Nov., p. 8 |
| "*Flight Simulator* Information Manuals Training Associates" | Training Associates | April/May, p. 12 |
| "*Flight Unlimited III*" | *Full Throttle* | April/May, p. 83 |
| "*Flight Unlimited III*" | Looking Glass Studios | Oct./Nov., p. 11 |
| "*Flight Unlimited III*" | Phil Paschutine | Dec./Jan., p. 22 |
| "Flights of Fancy" | Sherman Kaplan | June/July, p. 58 |
| "*FlightZip*" | Arnt Haaland | Aug./Sep., p. 12 |
| "The *Fly!* Scenery Editor: a First Look" | Basil Copeland | Dec./Jan., p. 33 |
| "Fly VFR 2" | Ron Broyles | Oct./Nov., p. 12 |
| "Flying the Boeing KC-135 Simulator" | Jim Rhoads | Aug./Sep., p. 18 |
| "*Freespace* 2" | Rod White | Dec./Jan., p. 92 |
| "FS 98 Series 747-400 Aircraft Operating Manual" | Jim Rhoads | April/May, p. 60 |
| "*FS Flight Deck*" | Abacus | Feb./March, p. 13 |
| "*FS Global Upgrade*" | Adam Howe | June/July, p. 87 |
| "*FS Meteo*" | Marc Philibert | Aug./Sep., p. 12 |
| "FS Planner 98" | Sascha Felix | June/July, p. 9 |
| "*FSTraffic*" | Lago | Dec./Jan., p. 7 |
| "FSX 98" | Kens Software | Aug./Sep., p. 13 |
| "*Fuel Calculator* 1.1" | Bryan Samis | June/July, p. 11 |
| "*Full Throttle* Flight Tests the New USB Flight Controllers" | Rod White | Aug./Sep., p. 59 |
| "*Full Throttle* Interviews the FS2000 Design Team" | *Full Throttle* | Aug./Sep., p. 34 |
| "*Full Throttle* Listens to 3-D Sound Cards" | Rod White | June/July, p. 25 |
| "*Full Throttle* Looks at DID's *Total Air War*" | Rod White | Feb./March, p. 41 |
| "*Full Throttle* Looks at *Jane's WWII Fighters*" | Rod White | Feb./March, p. 53 |
| "*Full Throttle* looks at Novalogic's *F-16 MRF/MiG-29 Fulcrum*" | Rod White | April/May, p. 51 |
| "Gaming on a Budget" | Rod White | Dec./Jan., p. 49 |
| "GameSeat" | Excelle Corp. | Aug./Sep., p. 7 |
| "*Grand Canyon*" | Wilco Publishing | June/July, p. 6 |
| "*Grand Canyon*" | Brian Howard | Dec./Jan., p. 87 |
| "*Gunship III*" | Rod White | Oct./Nov., p. 69 |
| "*Gunship III*" | Hasbro Interactive | Dec./Jan., p. 12 |
| "*Hang Sim*" | Wilco Publishing | Aug./Sep., p. 6 |
| "Homebuilders' Corner" | David Lewis | Feb./March, p. 33 |
| "Homebuilders' Corner" | David Lewis | April/May, p. 38 |
| "Homebuilders' Corner" | David Lewis | June/July, p. 54 |
| "Homebuilders' Corner" | David Lewis | Aug./Sep., p. 51 |
| "Homebuilders' Corner" | David Lewis | Dec./Jan., p. 58 |
| "How I Make Scenery" | Justin Tyme | April/May, p. 27 |
| "How I Make Scenery" | Justin Tyme | June/July, p. 33 |
| "How I Make Scenery" | Justin Tyme | Aug./Sep., p. 47 |
| "How I Make Scenery: Coastlines" | Justin Tyme | Feb./March, p. 29 |
| "The Intensor" | Adam Howe | Feb./March, p. 80 |
| "Internet Sites for Simmers" | Adam Howe | June/July, p. 15 |
| "Internet Sites for Simmers" | Adam Howe | Aug./Sep., p. 33 |
| "*JABGau98*" | Jacky Brouze | April/May, p. 11 |
| "*Jane's A-10 Warthog*" | Electronic Arts | April/May, p. 6 |
| "*Jane's WWII Fighters* Arrives" | Electronic Arts | Feb./March, p. 10 |
| "*Japanese Aircraft Collection*" | Lago | June/July, p. 7 |
| "*Jet Operator 2.03*" | Flyware | Feb./March, p. 13 |
| "*JetVision 99*" | JetVision software | June/July, p. 14 |
| "The Latest Advances in 3-D Adapters" | Rod White | Aug./Sep., p. 55 |
| "A Look at *Concorde SST*" | Tim Dickens | April/May, p. 76 |
| "A Look at Dangerous Airports" | Phil Paschutine | June/July, p. 62 |
| "A Look at *Falcon* 4.0" | Rod White | Feb./March, p. 65 |
| "*Luftwaffe Collection*" | Rod White | Oct./Nov., p. 79 |
| "*Mad Dog*" | Lago | June/July, p. 11 |
| "Making Photorealistic Textures from Images" | Justin Tyme | Oct./Nov., p. 46 |
| "Making a Procedure Trainer for the 442nd Search and Rescue Squadron" | Al Pelletier | April/May, p. 79 |
| "*MegaScenery DownUnder—Victoria*" | PC Aviator | April/May, p. 10 |
| "*MegaScenery Pacific Northwest*" | Scott Slaughter | Feb./March, p. 70 |
| "*MiG Alley*" | Empire Interactive | Feb./March, p. 7 |
| "*MiG Alley*" | Rod White | Aug./Sep., p. 68 |
| "Montego II Quadzilla" | Voyetra Turtle Beach | Aug./Sep., p. 11 |
| "My Day at the Paris Air Show" | Phil Paschutine | Dec./Jan., p. 67 |
| "*Myst Masterpiece Edition*" | Brian Howard | Oct./Nov., p. 81 |
| "*NavStar 99*" | NavStar Simulation | June/July, p. 10 |
| "New Horizons in Flight Simulation" | Tim Dickens | Oct./Nov., p. 26 |
| "*The Next Generation*" | Scott Slaughter | June/July, p. 83 |
| "*Pacific Northwest*" | PC Aviator | Dec./Jan., p. 8 |
| "*Pacific Theatre*" | Abacus | April/May, p. 7 |
| "*Pacific Theatre* Enhancement Package" | Abacus | Aug./Sep., p. 11 |
| "PAL Programmable Active Link Keyboard Accelerator" | Tim Dickens | June/July, p. 78 |
| "PC Dash" | Phil Paschutine | Aug./Sep., p. 87 |
| "Pedal Planes" | Aviation Products | April/May, p. 12 |
| "*PF2EFIS2*" | Pitman & Horton | Feb./March, p. 11 |
| "PFD" | Professional Flight Displays | Oct./Nov., p. 7 |
| "Pilot Tools" | Dauntless Software | Aug./Sep., p. 7 |
| "Precision Flight Controls" | Adam Howe | Feb./March, p. 82 |
| "*Precision Pilot*" | Interactive Associates | Dec./Jan., p. 12 |
| "A Preview of *Custom Panel Designer*" | Chuck Dome | April/May, p. 62 |
| "Preview of *Flight Unlimited III*" | Peter James | Feb./March, p. 63 |
| "A Preview of *Fly!*" | Tim Dickens | April/May, p. 71 |
| "*Proflight Series Vol II*" | AETI | Feb./March, p. 10 |
| "Quadzilla Stomps into Town" | Rod White | Oct./Nov., p. 59 |
| "*R/C Pilot*" | Brian Howard | June/July, p. 85 |
| "Radar Contact" | JDTLLC | June/July, p. 13 |
| "*Radar Contact* v.1.1" | JDTLLC | Aug./Sep., p. 10 |
| "*Radar Contact 99*" | Jim Rhoads | June/July, p. 72 |
| "*Red Baron 3-D*" | Brian Howard | Feb./March, p. 73 |
| "Round Robin #5;" England | Al Pelletier | Feb./March, p. 25 |
| "Round Robin Adventure;" Europe | Pelletier & Diedrich | Oct./Nov., p. 53 |
| "Round Robin Adventure;" Baja | Al Pelletier | Dec./Jan., p. 48 |
| "Round Robin Adventure #6;" Lake Michigan | Al Pelletier | April/May, p. 33 |
| "Round Robin Adventure #7;" Spain | Al Pelletier | June/July, p. 28 |
| "Round Robin Adventure #8;" British Columbia | Al Pelletier | Aug./Sep., p. 38 |
| "*Royal Air Force 2000*" | Interactive Associates | Oct./Nov., p. 12 |
| "S.A.L.S." | Glenn Copeland | Oct./Nov., p. 7 |

# Year-end Index


| | | |
|---|---|---|
| "SCC" | SCC | Dec./Jan., p. 13 |
| "Santa's FBO" | *Full Throttle* | Dec./Jan., p. 101 |
| "Scenery Design Corner" | Justin Tyme | Dec./Jan., p. 56 |
| "Sidewinder Force Feedback Pro" | Adam Howe | Aug./Sep., p. 84 |
| "*Sim Charts*" | Jim Rhoads | Oct./Nov., p. 75 |
| "*Sim-Hawk Pro Flight Training System*" | Jim Rhoads | Oct./Nov., p. 77 |
| "Sound All Around" | Rod White | Oct./Nov., p. 61 |
| "Special *Full Throttle* Look at FS 2000" | Tim Dickens | Dec./Jan., p. 14 |
| "Stacfs II" | Chuck Dome | Oct./Nov., p. 7 |
| "*Stuka Dive Bomber*" | Scott Slaughter | Oct./Nov., p. 73 |
| "TFCS" | VRF Corp. | Aug./Sep., p. 13 |
| "*Twelve O'Clock High*" | TalonSoft | Dec./Jan., p. 11 |
| "Understanding Airspace" | Jim Rhoads | Dec./Jan., p. 40 |
| "The United States Air Force Museum" | Jim Rhoads | June/July, p. 16 |
| "Update on Joe Rush" | Flight simulator personality | April/May, p. 13 |
| "USAF" | Electronic Arts | Dec./Jan., p. 6 |
| "USAF" | Rod White | Dec./Jan., p. 97 |
| "*VIP Classic Airlines*" | Scott Slaughter | Dec./Jan., p. 89 |
| "*VIP Classic Wings 'The Ultimate Collection'*" | PC Aviator | Feb./March, p. 15 |
| "*VIP Ultimate Classic Wings*" | Scott Slaughter | June/July, p. 76 |
| "Virtual Flight Training" | David Lewis | Aug./Sep., p. 43 |
| "Virtual Flight Training: 'Can You Hold Please?'" | David Lewis | June/July, p. 50 |
| "Virtual Flight Training: Flight Planning" | David Lewis | Feb./March, p. 17 |
| "Virtual Flight Training: Flight Planning" | David Lewis | April/May, p. 42 |
| "A Visit to the SATCO Kansas City Convention" | Tim Dickens | Dec./Jan., p. 47 |
| "*Visual Object Designer*" | Phil Paschutine | Oct./Nov., p. 64 |
| "*VOD 3.0*" | Rafael Sanchez | Oct./Nov., p. 13 |
| "*WeatherTAP*" | TAP Publishing | Dec./Jan., p. 10 |
| "What's New in 3-D Hardware Acceleration?" | Rod White | April/May, p. 46 |
| "Who is in Control: A Day in the Tower" | Jim Rhoads | April/May, p. 20 |
| "Wings over China" | *Abacus* | Oct./Nov., p. 10 |
| "Working with MS *Flight Simulator* Textures" | Tim Dickens | Feb./March, p. 37 |
| "*X-plane* 5.11" | Austin Meyers | Dec./Jan., p. 8 |
| "*X-wing Collector Edition & X-wing Alliance*" | Rod White | June/July, p. 80 |


| Subject | Title | Issue/page |
|---|---|---|
| 3-D graphic cards | "The Latest Advances in 3-D Adapters" | Aug./Sep., p. 55 |
| 3-D graphics cards | "What's New in 3-D Hardware Acceleration?" | April/May, p. 46 |
| 747 operating manual | "FS 98 Series 747-400 Aircraft Operating Manual" | April/May, p. 60 |
| A-10 simulator | "*Jane's A-10 Warthog*" | April/May, p. 6 |
| Add-on aircraft | "*VIP Classic Airlines*" | Dec./Jan., p. 89 |
| Advanced flight simulator | "Elite Electronic IFR Training Environment" | Feb./March, p. 47 |
| Adventure generator | "Radar Contact" | June/July, p. 13 |
| Adventure generator | "*Radar Contact* v.1.1" | Aug./Sep., p. 10 |
| Adventure simulator | "*Myst Masterpiece Edition*" | Oct./Nov., p. 81 |
| Air combat/strategy simulator | "*Full Throttle* Looks at DID's *Total Air War*" | Feb./March, p. 41 |
| Air traffic control | "Who is in Control: A Day in the Tower" | April/May, p. 20 |
| Aircraft design | "Homebuilders' Corner" | Feb./March, p. 33 |
| Aircraft design | "Homebuilders' Corner" | April/May, p. 38 |
| Aircraft design | "Homebuilders' Corner" | June/July, p. 54 |
| Aircraft design | "Homebuilders' Corner" | Aug./Sep., p. 51 |
| Aircraft design | "Homebuilders' Corner" | Dec./Jan., p. 58 |
| Aircraft designer | "*Aircraft Factory 99*" | April/May, p. 13 |
| Aircraft designer | "*Aircraft Factory 99*" | Aug./Sep., p. 76 |
| Aircraft editor | "*Aircraft Animator*" | Aug./Sep., p. 80 |
| Aircraft feature | "Dash 80" | Aug./Sep., p. 15 |
| ATC simulation | "*Air Command*" | April/May, p. 9 |
| Aviation database | "*Sim Charts*" | Oct./Nov., p. 75 |
| Aviation pedal cars | "C&N Reproductions" | Oct./Nov., p. 11 |
| Aviation Web sites | "Internet Sites for Simmers" | June/July, p. 15 |
| Aviation Web sites | "Internet Sites for Simmers" | Aug./Sep., p. 33 |
| CFS | "Customizing your Quick Combat Enemies in CFS" | Oct./Nov., p. 40 |
| CFS enhancement | "*Battle for Midway*" | June/July, p. 9 |
| CFS enhancement | "*Pacific Theatre*" | April/May, p. 7 |
| CFS enhancement | "*Pacific Theatre* Enhancement Package" | Aug./Sep., p. 11 |
| CFS enhancement | "*Stuka Dive Bomber*" | Oct./Nov., p. 73 |
| *CFS enhancement* | "Wings over China" | *Oct./Nov., p. 10* |
| CFS mission design | "Create your own CFS Missions" | Aug./Sep., p. 25 |
| CFS scenery add-on | "*MegaScenery DownUnder—Victoria*" | April/May, p. 10 |
| CFS static scenery object generator | "Stacfs | Oct./Nov., p. 7 |
| CFS utility | "*Combat Expansion Pack*" | Aug./Sep., p. 72 |
| CFS utility | "*DirectFlight* Combat Expansion Pack" | Aug./Sep., p. 10 |
| Class B approach plates | "Desktop Wings" | April/May, p. 9 |
| Combat flight simulations | "*Full Throttle* looks at Novalogic's *F-16 MRF/MiG-29 Fulcrum*" | April/May, p. 51 |
| Combat flight simulator | "*Desert Fighters*" | June/July, p. 13 |
| Combat flight simulator | "*European Air War*" | Feb./March, p. 58 |
| Combat flight simulator | "*Fighter Squadron: Screamin' Demons over Europe*" | April/May, p. 66 |
| Combat flight simulator | "*Flanker* 2.0" | Dec./Jan., p. 13 |
| Combat flight simulator | "*Full Throttle* Looks at *Jane's WWII Fighters*" | Feb./March, p. 53 |
| Combat flight simulator | "*Jane's WWII Fighters* Arrives" | Feb./March, p. 10 |
| Combat flight simulator | "A Look at *Falcon* 4.0" | Feb./March, p. 65 |
| Combat flight simulator | "*MiG Alley*" | Feb./March, p. 7 |
| Combat flight simulator | "*MiG Alley*" | Aug./Sep., p. 68 |
| Combat flight simulator | "*Twelve O'Clock High*" | Dec./Jan., p. 11 |
| Combat flight simulator | "USAF" | Dec./Jan., p. 6 |
| Combat flight simulator | "USAF" | Dec./Jan., p. 97 |
| Combat helicopter simulator | "*Apache Havoc*" | June/July, p. 12 |
| Combat helicopter simulator | "*Apache Havoc*" | June/July, p. 68 |
| Combat helicopter simulator | "*Gunship III*" | Dec./Jan., p. 12 |
| Custom aircraft models | "Anderson Fine Scale Replicas" | Oct./Nov., p. 10 |
| Desktop control unit | "*Sim-Hawk Pro Flight Training System*" | Oct./Nov., p. 77 |
| EFIS/ProFlight utility | "*PF2EFIS2*" | Feb./March, p. 11 |
| Flight controller | "Flight Sim Yoke (PC version)" | June/July, p. 79 |
| Flight lessons | "Virtual Flight Training" | Aug./Sep., p. 43 |
| Flight planning | "Virtual Flight Training: Flight Planning" | Feb./March, p. 17 |
| Flight Planning | "Virtual Flight Training: Flight Planning" | April/May, p. 42 |
| Flight sim buyer's guide | "Santa's FBO" | Dec./Jan., p. 101 |
| Flight sim pilot tools | "Pilot Tools" | Aug./Sep., p. 7 |
| Flight simulation | "Making a Procedure Trainer for the 442nd Search and Rescue Squadron" | April/May, p. 79 |
| Flight simulator | "*Airline Simulator 2*" | Aug./Sep., p. 8 |
| Flight simulator | "*Concorde SST* Supersonic Transport" | Feb./March, p. 16 |
| Flight simulator | "*Flight Simulator 2000*" | /Nov., p. 8 |
| Flight simulator | "*Flight Unlimited III*" | April/May, p. 83 |
| Flight simulator | "*Flight Unlimited III*" | Oct./Nov., p. 11 |
| Flight simulator | "*Flight Unlimited III*" | Dec./Jan., p. 22 |
| Flight simulator | "Preview of *Flight Unlimited III*" | Feb./March, p. 63 |
| Flight simulator | "A Preview of *Fly!*" | April/May, p. 71 |
| Flight simulator | "Special *Full Throttle* Look at FS 2000" | Dec./Jan., p. 14 |
| Flight simulator | "*X-plane* 5.11" | Dec./Jan., p. 8 |
| Flight simulator controller | "PAL Programmable Active Link Keyboard Accelerator" | June/July, p. 78 |
| Flight simulator convention | "A Visit to the SATCO Kansas City Convention" | Dec./Jan., p. 47 |
| Flight simulator personality | "Update on Joe Rush" | April/May, p. 13 |
| Flight yoke and rudder pedals | "Precision Flight Controls" | Feb./March, p. 82 |
| *Fly!* flight simulator | "Come *Fly!*, Come *Fly!* away…" | Oct./Nov., p. 14 |
| *Fly!* scenery add-on | "*Pacific Northwest*" | Dec./Jan., p. 8 |
| *Fly!* scenery utility | "*Dem2Ras*" | Dec./Jan., p. 7 |
| *Fly!* weather utility | "*AutoMETAR*" | Dec./Jan., p. 10 |
| FS 2000 | "*Full Throttle* Interviews the FS2000 Design Team" | Aug./Sep., p. 34 |
| FS 2000 | "New Horizons in Flight Simulation" | Oct./Nov., p. 26 |
| FS 98 aircraft add-on | "*Airbus 2000*" | June/July, p. 12 |
| FS 98 aircraft add-on | "*Aircraft Collection 99*" | Aug./Sep., p. 78 |
| FS 98 aircraft add-on | "*Proflight Series Vol II*" | Feb./March, p. 10 |
| FS 98 aircraft add-on | "*VIP Classic Wings 'The Ultimate Collection'*" | Feb./March, p. 15 |
| FS 98 ATC utility | "*Radar Contact 99*" | June/July, p. 72 |
| FS 98 cloud enhancement | "*Clouds.Zip*" | June/July, p. 14 |
| FS 98 Concorde enhancement | "A Look at *Concorde SST*" | April/May, p. 76 |
| FS 98 enhancement | "*Airport 2000*" | April/May, p. 55 |
| FS 98 enhancement | "A Look at Dangerous Airports" | June/July, p. 62 |
| FS 98 enhancement | "*Mad Dog*" | June/July, p. 11 |
| FS 98 enhancement | "*The Next Generation*" | June/July, p. 83 |
| FS 98 gauge utility | "*JABGau98*" | April/May, p. 11 |
| FS 98 IFR enhancement | "*Aviator Pro 98*" | Aug./Sep., p. 74 |
| FS 98 navigation utility | "*Course Finder 98*" | April/May, p. 11 |
| FS 98 navigation utility | "*JetVision 99*" | June/July, p. 14 |
| FS 98 panel designer | "A Preview of *Custom Panel Designer*" | April/May, p. 62 |
| FS 98 utility | "FS Planner 98" | June/July, p. 9 |
| FS 98 utility | "FSX 98" | Aug./Sep., p. 13 |
| FS 98 utility | "*NavStar 99*" | June/July, p. 10 |
| FS 98/CFS sky enhancement utility | "*Blue Sky*" | Oct./Nov., p. 6 |
| FS add-on | "SCC" | Dec./Jan., p. 13 |
| FS aircraft add-on | "*Japanese Aircraft Collection*" | June/July, p. 7 |
| FS aircraft add-on | "*VIP Ultimate Classic Wings*" | June/July, p. 76 |
| FS dynamic traffic utility | "*FSTraffic*" | Dec./Jan., p. 7 |
| FS enhancement | "*EFIS98: Electronic Flight Instrumentation System*" | Feb./March, p. 11 |
| FS glass cockpit instruments | "PFD" | Oct./Nov., p. 7 |
| FS training manuals | "*Flight Simulator* Information Manuals Training Associates" | April/May, p. 12 |
| FS utility | "*FlightZip*" | Aug./Sep., p. 12 |
| FS voice ATC utility | "Fly VFR 2" | Oct./Nov., p. 12 |
| FS weather enhancement | "*FS Meteo*" | Aug./Sep., p. 12 |
| FS/CFS 3-D object designer | "*VOD 3.0*" | Oct./Nov., p. 13 |
| FS/CFS enhancement | "*FS Flight Deck*" | Feb./March, p. 13 |
| FS/CFS enhancement | "*Grand Canyon*" | June/July, p. 6 |
| FS/CFS enhancement | "*Grand Canyon*" | Dec./Jan., p. 87 |
| FS/CFS enhancement | "*Luftwaffe Collection*" | Oct./Nov., p. 79 |
| FS/CFS enhancement | "*Royal Air Force 2000*" | Oct./Nov., p. 12 |
| FS/CFS object designer | "*Visual Object Designer*" | Oct./Nov., p. 64 |
| FS/CFS scenery add-on | "*FS Global Upgrade*" | June/July, p. 87 |
| FS/CFS scenery add-on | "*MegaScenery Pacific Northwest*" | Feb./March, p. 70 |
| FS/CFS utility | "*Aircraft Animator*" | Aug./Sep., p. 12 |
| FS/CFS utility | "*Control 2000* Aircraft Manager" | Feb./March, p. 14 |
| FS98/ProFlight 98 utility | "*Flight Director 99*" | Aug./Sep., p. 63 |
| Fuel calculating utility | "*Fuel Calculator* 1.1" | June/July, p. 11 |
| Game controller | "PC Dash" | Aug./Sep., p. 87 |
| Game controller | "Sidewinder Force Feedback Pro" | Aug./Sep., p. 84 |
| Gaming chair | "GameSeat" | Aug./Sep., p. 7 |
| Gaming chair | "The Intensor" | Feb./March, p. 80 |
| Gaming chair | "TFCS" | Aug./Sep., p. 13 |
| Holding patterns | "Virtual Flight Training: 'Can You Hold Please?'" | June/July, p. 50 |

| | | |
|---|---|---|
| IFR radio simulator | "*Comm1 IFR*" | Dec./Jan., p. 10 |
| IFR training add-on | "Elite" | Oct./Nov., p. 13 |
| Jet aircraft flight calculator | "*Jet Operator 2.03*" | Feb./March, p. 13 |
| KC-135 simulator | "Flying the Boeing KC-135 Simulator" | Aug./Sep., p. 18 |
| Keyboard control covers | "Cockpit Collection" | June/July, p. 10 |
| Light aviation simulator | "*Hang Sim*" | Aug./Sep., p. 6 |
| Military combat simulator | "*Gunship III*" | Oct./Nov., p. 69 |
| Naval warfare simulator | "*Fleet Command*" | Oct./Nov., p. 82 |
| Navigation training utility | "*Precision Pilot*" | Dec./Jan., p. 12 |
| NOAA charts | "DeskTop Wings" | Dec./Jan., p. 11 |
| Paris Air Show | "My Day at the Paris Air Show" | Dec./Jan., p. 67 |
| PC hardware | "Gaming on a Budget" | Dec./Jan., p. 49 |
| Pedal toy plane kits | "Pedal Planes" | April/May, p. 12 |
| Pilot communication trainer | "*Comm1*" | Feb./March, p. 77 |
| Pilot communication trainer | "*Comm1* Pilot Communications Training" | Feb./March, p. 12 |
| Radio control model airplane simulator | R/C Pilot | June/July, p. 85 |
| Real-world airspace | "Understanding Airspace" | Dec./Jan., p. 40 |
| Real-world weather utility | "*WeatherTAP*" | Dec./Jan., p. 10 |
| Round Robin | "Round Robin #5;" England | Feb./March, p. 25 |
| Round Robin | "Round Robin Adventure #6;" Lake Michigan | April/May, p. 33 |
| Round Robin | "Round Robin Adventure #7;" Spain | June/July, p. 28 |
| Round Robin | "Round Robin Adventure #8;" British Columbia | Aug./Sep., p. 38 |
| Round Robin | "Round Robin Adventure;" Europe | Oct./Nov., p. 53 |
| Round Robin | "Round Robin Adventure;" Baja | Dec./Jan., p. 48 |
| Satellite Assisted Landing System | "S.A.L.S." | Oct./Nov., p. 7 |
| Scenery animator | "*Dynamic Object Libraries*" | Feb./March, p. 14 |
| Scenery design | "Everything you Wanted to Know about Elevated Mesh Terrain for MS *Flight Simulator*" | June/July, p. 42 |
| Scenery design | "Exploding Objects in Microsoft *Combat Flight Simulator*" | April/May, p. 15 |
| Scenery design | "The *Fly!* Scenery Editor: a First Look" | Dec./Jan., p. 33 |
| Scenery design | "How I Make Scenery: Coastlines" | Feb./March, p. 29 |
| Scenery design | "How I Make Scenery" | April/May, p. 27 |
| Scenery design | "How I Make Scenery" | June/July, p. 33 |
| Scenery design | "How I Make Scenery" | Aug./Sep., p. 47 |
| Scenery design | "Making Photorealistic Textures from Images" | Oct./Nov., p. 46 |
| Scenery design | "Scenery Design Corner" | Dec./Jan., p. 56 |
| Scenery design | "Working with MS *Flight Simulator* Textures" | Feb./March, p. 37 |
| Scenery designer | "*Airport & Scenery Designer*" | Dec./Jan., p. 80 |
| Sound card | "Montego II Quadzilla" | Aug./Sep., p. 11 |
| Sound card | "Quadzilla Stomps into Town" | Oct./Nov., p. 59 |
| Sound cards | "*Full Throttle* Listens to 3-D Sound Cards" | June/July, p. 25 |
| Sound system | "Sound All Around" | Oct./Nov., p. 61 |
| Space combat simulator | "*Freespace* 2" | Dec./Jan., p. 92 |
| Space combat simulator | "*X-wing Collector Edition* & *X-wing Alliance*" | June/July, p. 80 |
| *Total Air War* | "Combat Flight Sim/Strategy Game" | Feb./March, p. 6 |
| USAF museum | "The United States Air Force Museum" | June/July, p. 16 |
| USB controllers | "*Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| Virtual Airlines | "Flights of Fancy" | June/July, p. 58 |
| Weather data | "Basics of Deciphering International METARs without Toil" | June/July, p. 89 |
| WWI combat flight simulator | "*Red Baron 3-D*" | Feb./March, p. 73 |
| X-Plane utility | "*Flight Management System II*" | Oct./Nov., p. 8 |


## Subject / Title / Issue/page


| | | |
|---|---|---|
| 3-D graphic cards | "The Latest Advances in 3-D Adapters" | Aug./Sep., p. 55 |
| 3-D graphics cards | "What's New in 3-D Hardware Acceleration?" | April/May, p. 46 |
| 747 operating manual | "FS 98 Series 747-400 Aircraft Operating Manual" | April/May, p. 60 |
| A-10 simulator | "*Jane's A-10 Warthog*" | April/May, p. 6 |
| Add-on aircraft | "*VIP Classic Airlines*" | Dec./Jan., p. 89 |
| Advanced flight simulator | "Elite Electronic IFR Training Environment" | Feb./March, p. 47 |
| Adventure generator | "Radar Contact" | June/July, p. 13 |
| Adventure generator | "*Radar Contact* v.1.1" | Aug./Sep., p. 10 |
| Adventure simulator | "*Myst Masterpiece Edition*" | Oct./Nov., p. 81 |
| Air combat/strategy simulator | "*Full Throttle* Looks at DID's *Total Air War*" | Feb./March, p. 41 |
| Air traffic control | "Who is in Control: A Day in the Tower" | April/May, p. 20 |
| Aircraft design | "Homebuilders' Corner" | Feb./March, p. 33 |
| Aircraft design | "Homebuilders' Corner" | April/May, p. 38 |
| Aircraft design | "Homebuilders' Corner" | June/July, p. 54 |
| Aircraft design | "Homebuilders' Corner" | Aug./Sep., p. 51 |
| Aircraft design | "Homebuilders' Corner" | Dec./Jan., p. 58 |
| Aircraft designer | "*Aircraft Factory 99*" | April/May, p. 13 |
| Aircraft designer | "*Aircraft Factory 99*" | Aug./Sep., p. 76 |
| Aircraft editor | "*Aircraft Animator*" | Aug./Sep., p. 80 |
| Aircraft feature | "Dash 80" | Aug./Sep., p. 15 |
| ATC simulation | "*Air Command*" | April/May, p. 9 |
| Aviation database | "*Sim Charts*" | Oct./Nov., p. 75 |
| Aviation pedal cars | "C&N Reproductions" | Oct./Nov., p. 11 |
| Aviation Web sites | "Internet Sites for Simmers" | June/July, p. 15 |
| Aviation Web sites | "Internet Sites for Simmers" | Aug./Sep., p. 33 |
| CFS | "Customizing your Quick Combat Enemies in CFS" | Oct./Nov., p. 40 |
| CFS enhancement | "*Battle for Midway*" | June/July, p. 9 |
| CFS enhancement | "*Pacific Theatre*" | April/May, p. 7 |
| CFS enhancement | "*Pacific Theatre* Enhancement Package" | Aug./Sep., p. 11 |
| CFS enhancement | "*Stuka Dive Bomber*" | Oct./Nov., p. 73 |
| *CFS enhancement* | "Wings over China" | *Oct./Nov., p. 10* |
| CFS mission design | "Create your own CFS Missions" | Aug./Sep., p. 25 |
| CFS scenery add-on | "*MegaScenery DownUnder—Victoria*" | April/May, p. 10 |
| CFS static scenery object generator | "Stacfs II" | Oct./Nov., p. 7 |
| CFS utility | "*Combat Expansion Pack*" | Aug./Sep., p. 72 |
| CFS utility | "*DirectFlight* Combat Expansion Pack" | Aug./Sep., p. 10 |
| Class B approach plates | "Desktop Wings" | April/May, p. 9 |
| Combat flight simulations | "*Full Throttle* looks at Novalogic's *F-16 MRF/MiG-29 Fulcrum*" | April/May, p. 51 |
| Combat flight simulator | "*Desert Fighters*" | June/July, p. 13 |
| Combat flight simulator | "*European Air War*" | Feb./March, p. 58 |
| Combat flight simulator | "*Fighter Squadron: Screamin' Demons over Europe*" | April/May, p. 66 |
| Combat flight simulator | "*Flanker* 2.0" | Dec./Jan., p. 13 |
| Combat flight simulator | "*Full Throttle* Looks at *Jane's WWII Fighters*" | Feb./March, p. 53 |
| Combat flight simulator | "*Jane's WWII Fighters* Arrives" | Feb./March, p. 10 |
| Combat flight simulator | "A Look at *Falcon* 4.0" | Feb./March, p. 65 |
| Combat flight simulator | "*MiG Alley*" | Feb./March, p. 7 |
| Combat flight simulator | "*MiG Alley*" | Aug./Sep., p. 68 |
| Combat flight simulator | "*Twelve O'Clock High*" | Dec./Jan., p. 11 |
| Combat flight simulator | "USAF" | Dec./Jan., p. 6 |
| Combat flight simulator | "USAF" | Dec./Jan., p. 97 |
| Combat helicopter simulator | "*Apache Havoc*" | June/July, p. 12 |
| Combat helicopter simulator | "*Apache Havoc*" | June/July, p. 68 |
| Combat helicopter simulator | "*Gunship III*" | Dec./Jan., p. 12 |
| Custom aircraft models | "Anderson Fine Scale Replicas" | Oct./Nov., p. 10 |
| Desktop control unit | "*Sim-Hawk Pro Flight Training System*" | Oct./Nov., p. 77 |
| EFIS/ProFlight utility | "*PF2EFIS2*" | Feb./March, p. 11 |
| Flight controller | "Flight Sim Yoke (PC version)" | June/July, p. 79 |
| Flight lessons | "Virtual Flight Training" | Aug./Sep., p. 43 |
| Flight planning | "Virtual Flight Training: Flight Planning" | Feb./March, p. 17 |
| Flight Planning | "Virtual Flight Training: Flight Planning" | April/May, p. 42 |
| Flight sim buyer's guide | "Santa's FBO" | Dec./Jan., p. 101 |
| Flight sim pilot tools | "Pilot Tools" | Aug./Sep., p. 7 |
| Flight simulation | "Making a Procedure Trainer for the 442nd Search and Rescue Squadron" | April/May, p. 79 |
| Flight simulator | "*Airline Simulator 2*" | Aug./Sep., p. 8 |
| Flight simulator | "*Concorde SST* Supersonic Transport" | Feb./March, p. 16 |
| Flight simulator | "*Flight Simulator 2000*" | Oct/Nov., p. 8 |
| Flight simulator | "*Flight Unlimited III*" | April/May, p. 83 |
| Flight simulator | "*Flight Unlimited III*" | Oct./Nov., p. 11 |
| Flight simulator | "*Flight Unlimited III*" | Dec./Jan., p. 22 |
| Flight simulator | "Preview of *Flight Unlimited III*" | Feb./March, p. 63 |
| Flight simulator | "A Preview of *Fly!*" | April/May, p. 71 |
| Flight simulator | "Special *Full Throttle* Look at FS 2000" | Dec./Jan., p. 14 |
| Flight simulator | "*X-plane* 5.11" | Dec./Jan., p. 8 |
| Flight simulator controller | "PAL Programmable Active Link Keyboard Accelerator" | June/July, p. 78 |
| Flight simulator convention | "A Visit to the SATCO Kansas City Convention" | Dec./Jan., p. 47 |
| Flight simulator personality | "Update on Joe Rush" | April/May, p. 13 |
| Flight yoke and rudder pedals | "Precision Flight Controls" | Feb./March, p. 82 |
| *Fly!* flight simulator | "Come *Fly!*, Come *Fly!* away…" | Oct./Nov., p. 14 |
| *Fly!* scenery add-on | "*Pacific Northwest*" | Dec./Jan., p. 8 |
| *Fly!* scenery utility | "*Dem2Ras*" | Dec./Jan., p. 7 |
| *Fly!* weather utility | "*AutoMETAR*" | Dec./Jan., p. 10 |
| FS 2000 | "*Full Throttle* Interviews the FS2000 Design Team" | Aug./Sep., p. 34 |
| FS 2000 | "New Horizons in Flight Simulation" | Oct./Nov., p. 26 |
| FS 98 aircraft add-on | "*Airbus 2000*" | June/July, p. 12 |
| FS 98 aircraft add-on | "*Aircraft Collection 99*" | Aug./Sep., p. 78 |
| FS 98 aircraft add-on | "*Proflight Series Vol II*" | Feb./March, p. 10 |
| FS 98 aircraft add-on | "*VIP Classic Wings 'The Ultimate Collection'*" | Feb./March, p. 15 |
| FS 98 ATC utility | "*Radar Contact 99*" | June/July, p. 72 |
| FS 98 cloud enhancement | "*Clouds.Zip*" | June/July, p. 14 |
| FS 98 Concorde enhancement | "A Look at *Concorde SST*" | April/May, p. 76 |
| FS 98 enhancement | "*Airport 2000*" | April/May, p. 55 |
| FS 98 enhancement | "A Look at Dangerous Airports" | June/July, p. 62 |
| FS 98 enhancement | "*Mad Dog*" | June/July, p. 11 |
| FS 98 enhancement | "*The Next Generation*" | June/July, p. 83 |
| FS 98 gauge utility | "*JABGau98*" | April/May, p. 11 |
| FS 98 IFR enhancement | "*Aviator Pro 98*" | Aug./Sep., p. 74 |
| FS 98 navigation utility | "*Course Finder 98*" | April/May, p. 11 |
| FS 98 navigation utility | "*JetVision 99*" | June/July, p. 14 |
| FS 98 panel designer | "A Preview of *Custom Panel Designer*" | April/May, p. 62 |
| FS 98 utility | "FS Planner 98" | June/July, p. 9 |
| FS 98 utility | "FSX 98" | Aug./Sep., p. 13 |
| FS 98 utility | "*NavStar 99*" | June/July, p. 10 |
| FS 98/CFS sky enhancement utility | "*Blue Sky*" | Oct./Nov., p. 6 |
| FS add-on | "SCC" | Dec./Jan., p. 13 |
| FS aircraft add-on | "*Japanese Aircraft Collection*" | June/July, p. 7 |
| FS aircraft add-on | "*VIP Ultimate Classic Wings*" | June/July, p. 76 |
| FS dynamic traffic utility | "*FSTraffic*" | Dec./Jan., p. 7 |
| FS enhancement | "*EFIS98: Electronic Flight Instrumentation System*" | Feb./March, p. 11 |
| FS glass cockpit instruments | "PFD" | Oct./Nov., p. 7 |
| FS training manuals | "*Flight Simulator* Information Manuals Training Associates" | April/May, p. 12 |
| FS utility | "*FlightZip*" | Aug./Sep., p. 12 |
| FS voice ATC utility | "Fly VFR 2" | Oct./Nov., p. 12 |
| FS weather enhancement | "*FS Meteo*" | Aug./Sep., p. 12 |
| FS/CFS 3-D object designer | "*VOD 3.0*" | Oct./Nov., p. 13 |

# Year-end Index


| | | |
|---|---|---|
| FS/CFS enhancement | *"FS Flight Deck"* | Feb./March, p. 13 |
| FS/CFS enhancement | *"Grand Canyon"* | June/July, p. 6 |
| FS/CFS enhancement | *"Grand Canyon"* | Dec./Jan., p. 87 |
| FS/CFS enhancement | *"Luftwaffe Collection"* | Oct./Nov., p. 79 |
| FS/CFS enhancement | *"Royal Air Force 2000"* | Oct./Nov., p. 12 |
| FS/CFS object designer | *"Visual Object Designer"* | Oct./Nov., p. 64 |
| FS/CFS scenery add-on | *"FS Global Upgrade"* | June/July, p. 87 |
| FS/CFS scenery add-on | *"MegaScenery Pacific Northwest"* | Feb./March, p. 70 |
| FS/CFS utility | *"Aircraft Animator"* | Aug./Sep., p. 12 |
| FS/CFS utility | *"Control 2000* Aircraft Manager" | Feb./March, p. 14 |
| FS98/ProFlight 98 utility | *"Flight Director 99"* | Aug./Sep., p. 63 |
| Fuel calculating utility | *"Fuel Calculator* 1.1" | June/July, p. 11 |
| Game controller | "PC Dash" | Aug./Sep., p. 87 |
| Game controller | "Sidewinder Force Feedback Pro" | Aug./Sep., p. 84 |
| Gaming chair | "GameSeat" | Aug./Sep., p. 7 |
| Gaming chair | "The Intensor" | Feb./March, p. 80 |
| Gaming chair | "TFCS" | Aug./Sep., p. 13 |
| Holding patterns | "Virtual Flight Training: 'Can You Hold Please?'" | June/July, p. 50 |
| IFR radio simulator | *"Comm1 IFR"* | Dec./Jan., p. 10 |
| IFR training add-on | "Elite" | Oct./Nov., p. 13 |
| Jet aircraft flight calculator | *"Jet Operator 2.03"* | Feb./March, p. 13 |
| KC-135 simulator | "Flying the Boeing KC-135 Simulator" | Aug./Sep., p. 18 |
| Keyboard control covers | "Cockpit Collection" | June/July, p. 10 |
| Light aviation simulator | *"Hang Sim"* | Aug./Sep., p. 6 |
| Military combat simulator | *"Gunship III"* | Oct./Nov., p. 69 |
| Naval warfare simulator | *"Fleet Command"* | Oct./Nov., p. 82 |
| Navigation training utility | *"Precision Pilot"* | Dec./Jan., p. 12 |
| NOAA charts | "DeskTop Wings" | Dec./Jan., p. 11 |
| Paris Air Show | "My Day at the Paris Air Show" | Dec./Jan., p. 67 |
| PC hardware | "Gaming on a Budget" | Dec./Jan., p. 49 |
| Pedal toy plane kits | "Pedal Planes" | April/May, p. 12 |
| Pilot communication trainer | *"Comm1"* | Feb./March, p. 77 |
| Pilot communication trainer | *"Comm1* Pilot Communications Training" | Feb./March, p. 12 |
| Radio control model airplane simulator | *"R/C Pilot"* | June/July, p. 85 |
| Real-world airspace | "Understanding Airspace" | Dec./Jan., p. 40 |
| Real-world weather utility | *"WeatherTAP"* | Dec./Jan., p. 10 |
| Round Robin | "Round Robin °5;" England | Feb./March, p. 25 |
| Round Robin | "Round Robin Adventure °6;" Lake Michigan | April/May, p. 33 |
| Round Robin | "Round Robin Adventure °7;" Spain | June/July, p. 28 |
| Round Robin | "Round Robin Adventure °8;" British Columbia | Aug./Sep., p. 38 |
| Round Robin | "Round Robin Adventure;" Europe | Oct./Nov., p. 53 |
| Round Robin | "Round Robin Adventure;" Baja | Dec./Jan., p. 48 |
| Satellite Assisted Landing System | "S.A.L.S." | Oct./Nov., p. 7 |
| Scenery animator | *"Dynamic Object Libraries"* | Feb./March, p. 14 |
| Scenery design | "Everything you Wanted to Know about Elevated Mesh Terrain for MS *Flight Simulator*" | June/July, p. 42 |
| Scenery design | "Exploding Objects in Microsoft *Combat Flight Simulator*" | April/May, p. 15 |
| Scenery design | "The *Fly!* Scenery Editor: a First Look" | Dec./Jan., p. 33 |
| Scenery design | "How I Make Scenery: Coastlines" | Feb./March, p. 29 |
| Scenery design | "How I Make Scenery" | April/May, p. 27 |
| Scenery design | "How I Make Scenery" | June/July, p. 33 |
| Scenery design | "How I Make Scenery" | Aug./Sep., p. 47 |
| Scenery design | "Making Photorealistic Textures from Images" | Oct./Nov., p. 46 |
| Scenery design | "Scenery Design Corner" | Dec./Jan., p. 56 |
| Scenery design | "Working with MS *Flight Simulator* Textures" | Feb./March, p. 37 |
| Scenery designer | *"Airport & Scenery Designer"* | Dec./Jan., p. 80 |
| Sound card | "Montego II Quadzilla" | Aug./Sep., p. 11 |
| Sound card | "Quadzilla Stomps into Town" | Oct./Nov., p. 59 |
| Sound cards | *"Full Throttle* Listens to 3-D Sound Cards" | June/July, p. 25 |
| Sound system | "Sound All Around" | Oct./Nov., p. 61 |
| Space combat simulator | *"Freespace* 2" | Dec./Jan., p. 92 |
| Space combat simulator | *"X-wing Collector Edition* & *X-wing Alliance"* | June/July, p. 80 |
| *Total Air War* | "Combat Flight Sim/Strategy Game" | Feb./March, p. 6 |
| USAF museum | "The United States Air Force Museum" | June/July, p. 16 |
| USB controllers | *"Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| Virtual Airlines | "Flights of Fancy" | June/July, p. 58 |
| Weather data | "Basics of Deciphering International METARs without Toil" | June/July, p. 89 |
| WWI combat flight simulator | *"Red Baron 3-D"* | Feb./March, p. 73 |
| X-Plane utility | *"Flight Management System II"* | Oct./Nov., p. 8 |

**Author Title ..... Subject**
**Issue/page**

| | | |
|---|---|---|
| Basil Copeland | "Come *Fly!*, Come *Fly!* away…" | Oct./Nov., p. 14 |
| Basil Copeland | "The *Fly!* Scenery Editor: a First Look" | Dec./Jan., p. 33 |
| Tim Dickens | "Everything you Wanted to Know about Elevated Mesh Terrain for MS *Flight Simulator* | June/July, p. 42 |
| Tim Dickens | "Flight Sim Yoke (PC version)" | June/July, p. 79 |
| Tim Dickens | "A Look at *Concorde SST*" | April/May, p. 76 |
| Tim Dickens | "New Horizons in Flight Simulation" | Oct./Nov., p. 26 |
| Tim Dickens | "PAL Programmable Active Link Keyboard Accelerator" | June/July, p. 78 |
| Tim Dickens | "A Preview of *Fly!*" | April/May, p. 71 |
| Tim Dickens | "Special *Full Throttle* Look at FS 2000" | Dec./Jan., p. 14 |
| Tim Dickens | "A Visit to the SATCO Kansas City Convention" | Dec./Jan., p. 47 |
| Tim Dickens | "Working with MS *Flight Simulator* Textures" | Feb./March, p. 37 |
| Chuck Dome | "A Preview of *Custom Panel Designer*" | April/May, p. 62 |
| *Full Throttle* | | |
| *Full Throttle* | | |
| *Full Throttle* | | |
| Brian Howard | | |
| Brian Howard | | |
| Brian Howard | | |
| Brian Howard | | |
| Brian Howard | | |
| Adam Howe | | |
| Adam Howe | | |
| Adam Howe | | |
| Adam Howe | | |
| Adam Howe | | |
| Adam Howe | | |
| Peter James | | |
| Sherman Kaplan | | |
| Konstantin Kukushkin | | |
| David Lewis | | |
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| Scott Slaughter | | |
| Chris Steele | | |
| Justin Tyme | | |
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| Rod White | | |
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| | | |
|---|---|---|
| | *"Full Throttle* Interviews the FS2000 Design Team" | Aug./Sep., p. 34 |
| | "Santa's FBO" | Dec./Jan., p. 101 |
| | "Update on Joe Rush" | April/May, p. 13 |
| | "Customizing your Quick Combat Enemies in CFS" | Oct./Nov., p. 40 |
| | *"Grand Canyon"* | Dec./Jan., p. 87 |
| | *"Myst Masterpiece Edition"* | Oct./Nov., p. 81 |
| | *"R/C Pilot"* | June/July, p. 85 |
| | *"Red Baron 3-D"* | Feb./March, p. 73 |
| | *"FS Global Upgrade"* | June/July, p. 87 |
| | "The Intensor" | Feb./March, p. 80 |
| | "Internet Sites for Simmers" | June/July, p. 15 |
| | "Internet Sites for Simmers" | Aug./Sep., p. 33 |
| | "Precision Flight Controls" | Feb./March, p. 82 |
| | "Sidewinder Force Feedback Pro" | Aug./Sep., p. 84 |
| | "Preview of *Flight Unlimited III*" | Feb./March, p. 63 |
| | "Flights of Fancy" | June/July, p. 58 |
| | "Exploding Objects in Microsoft *Combat Flight Simulator*" | April/May, p. 15 |
| | "Homebuilders' Corner" | Feb./March, p. 33 |
| | "Homebuilders' Corner" | April/May, p. 38 |
| | "Homebuilders' Corner" | June/July, p. 54 |
| | "Homebuilders' Corner" | Aug./Sep., p. 51 |
| | "Homebuilders' Corner" | Dec./Jan., p. 58 |
| | "Virtual Flight Training" | Aug./Sep., p. 43 |
| | "Virtual Flight Training: 'Can You Hold Please?'" | June/July, p. 50 |
| | "Virtual Flight Training: Flight Planning" | Feb./March, p. 17 |
| | "Virtual Flight Training: Flight Planning" | April/May, p. 42 |
| | *"Aircraft Animator"* | Aug./Sep., p. 80 |
| | *"Aircraft Factory 99"* | Aug./Sep., p. 76 |
| | *"Airport 2000"* | April/May, p. 55 |
| | *"Airport & Scenery Designer"* | Dec./Jan., p. 80 |
| | "Basics of Deciphering International METARs without Toil" | June./July, p. 89 |
| | *"Flight Unlimited III"* | Dec./Jan., p. 22 |
| | "A Look at Dangerous Airports" | June/July, p. 62 |
| | "My Day at the Paris Air Show" | Dec./Jan., p. 67 |
| | "PC Dash" | Aug./Sep., p. 87 |
| | *"Visual Object Designer"* | Oct./Nov., p. 64 |
| | "Making a Procedure Trainer for the 442nd Search and Rescue Squadron" | April/May, p. 79 |
| | "Round Robin °5;" England | Feb./March, p. 25 |
| | "Round Robin Adventure °6;" Lake Michigan | April/May, p. 33 |
| | "Round Robin Adventure °7;" Spain | June/July, p. 28 |
| | "Round Robin Adventure °8;" British Columbia | Aug./Sep., p. 38 |
| | "Round Robin Adventure;" Baja | Dec./Jan., p. 48 |
| | "Round Robin Adventure;" Europe | Oct./Nov., p. 53 |
| | *"Combat Expansion Pack"* | Aug./Sep., p. 72 |
| | *"Comm1"* | Feb./March, p. 77 |
| | "Dash 80" | Aug./Sep., p. 15 |
| | "Elite Electronic IFR Training Environment" | Feb./March, p. 47 |
| | "Flying the Boeing KC-135 Simulator" | Aug./Sep., p. 18 |
| | "FS 98 Series 747-400 Aircraft Operating Manual" | April/May, p. 60 |
| | *"Radar Contact 99"* | June/July, p. 72 |
| | *"Sim Charts"* | Oct./Nov., p. 75 |
| | *"Sim-Hawk Pro Flight Training System"* | Oct./Nov., p. 77 |
| | "Understanding Airspace" | Dec./Jan., p. 40 |
| | "The United States Air Force Museum" | June/July, p. 16 |
| | "Who is in Control: A Day in the Tower" | April/May, p. 20 |
| | *"Aircraft Collection 99"* | Aug./Sep., p. 78 |
| | *"Aviator Pro 98"* | Aug./Sep., p. 74 |
| | *"Fleet Command"* | Oct./Nov., p. 82 |
| | *"MegaScenery Pacific Northwest"* | Feb./March, p. 70 |
| | *"The Next Generation"* | June/July, p. 83 |
| | *"Stuka Dive Bomber"* | Oct./Nov., p. 73 |
| | *"VIP Classic Airlines"* | Dec./Jan., p. 89 |
| | *"VIP Ultimate Classic Wings"* | June/July, p. 76 |
| | "Create your own CFS Missions" | Aug./Sep., p. 25 |
| | "How I Make Scenery: Coastlines" | Feb./March, p. 29 |
| | "How I Make Scenery" | April/May, p. 27 |
| | "How I Make Scenery" | Aug./Sep., p. 47 |
| | "How I Make Scenery" | June/July, p. 33 |
| | "Making Photorealistic Textures from Images" | Oct./Nov., p. 46 |
| | "Scenery Design Corner" | Dec./Jan., p. 56 |
| | *"Apache Havoc"* | June/July, p. 68 |
| | *"European Air War"* | Feb./March, p. 58 |
| | *"Fighter Squadron: Screamin' Demons over Europe"* | April/May, p. 66 |
| | *"Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| | *"Full Throttle* Listens to 3-D Sound Cards" | June/July, p. 25 |
| | *"Full Throttle* Looks at DID's *Total Air War"* | Feb./March, p. 41 |
| | *"Full Throttle* Looks at *Jane's WWII Fighters"* | Feb./March, p. 53 |
| | *"Full Throttle* looks at Novalogic's *F-16 MRF/MiG-29 Fulcrum"* | April/May, p. 51 |
| | *"Freespace* 2" | Dec./Jan., p. 92 |
| | "Gaming on a Budget" | Dec./Jan., p. 49 |
| | *"Gunship III"* | Oct./Nov., p. 69 |
| | "The Latest Advances in 3-D Adapters" | Aug./Sep., p. 55 |

| | | |
|---|---|---|
| Rod White | "A Look at *Falcon* 4.0" | Feb./March, p. 65 |
| Rod White | "*Luftwaffe Collection*" | Oct./Nov., p. 79 |
| Rod White | "*MiG Alley*" | Aug./Sep., p. 68 |
| Rod White | "Quadzilla Stomps into Town" | Oct./Nov., p. 59 |
| Rod White | "Sound All Around" | Oct./Nov., p. 61 |
| Rod White | "USAF" | Dec./Jan., p. 97 |
| Rod White | "What's New in 3-D Hardware Acceleration?" | April/May, p. 46 |
| Rod White | "*X-wing Collector Edition* & *X-wing Alliance*" | June/July, p. 80 |

| **Man./Pub.** | **Title** | **Issue/page** |
|---|---|---|
| 3Dfx | "What's New in 3-D Hardware Acceleration?" | April/May, p. 46 |
| Abacus Software | "*Aircraft Animator*" | Aug./Sep., p. 12 |
| Abacus Software | "*Aircraft Animator*" | Aug./Sep., p. 80 |
| Abacus Software | "*Aircraft Factory 99*" | April/May, p. 13 |
| Abacus Software | "*Aircraft Factory 99*" | Aug./Sep., p. 76 |
| Abacus Software | "*Airport & Scenery Designer*" | Dec./Jan., p. 80 |
| Abacus Software | "*Battle for Midway*" | June/July, p. 9 |
| Abacus Software | "*Dynamic Object Libraries*" | Feb./March, p. 14 |
| Abacus Software | "*FS Flight Deck*" | Feb./March, p. 13 |
| Abacus Software | "A Look at Dangerous Airports" | Jne/July, p. 62 |
| Abacus Software | "*Pacific Theatre*" | April/May, p. 7 |
| Abacus Software | "*Pacific Theatre* Enhancement Package" | Aug./Sep., p. 11 |
| Abacus Software | "A Preview of *Custom Panel Designer*" | April/May, p. 62 |
| *Abacus Software* | "Wings over China" | Oct./Nov., p. 10 |
| Activision | "*Fighter Squadron: Screamin' Demons over Europe*" | April/May, p. 66 |
| AETI | "*The Next Generation*" | June/July, p. 83 |
| AETI | "*Proflight Series Vol II*" | Feb./March, p. 10 |
| Anderson Fine Scale Replicas | "Anderson Fine Scale Replicas" | Oct./Nov., p. 10 |
| Arnt Haaland | "*FlightZip*" | Aug./Sep., p. 12 |
| Austin Meyers | "*X-plane* 5.11" | Dec./Jan., p. 8 |
| Aviation Products | "Pedal Planes" | April/May, p. 12 |
| Aviation Teachware Technologies | "Elite" | Oct./Nov., p. 13 |
| Aviation Teachware Technologies | "Elite Electronic IFR Training Environment" | Feb./March, p. 47 |
| Bryan Samis | "*Fuel Calculator* 1.1" | June/July, p. 11 |
| BSG Laboratories | "The Intensor" | Feb./March, p. 80 |
| C&N Reproductions | "C&N Reproductions" | Oct./Nov., p. 11 |
| CH Products | "Flight Sim Yoke (PC version)" | June/July, p. 79 |
| CH Products | "*Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| Chuck Dome | "Stacfs II" | Oct./Nov., p. 7 |
| Cockpit Collection | "Cockpit Collection" | June/July, p. 10 |
| Control Vision | "*Sim-Hawk Pro Flight Training System*" | Oct./Nov., p. 77 |
| Creative Labs | "*Full Throttle* Listens to 3-D Sound Cards" | June/July, p. 25 |
| Creative Labs | "Sound All Around" | Oct./Nov., p. 61 |
| Data Becker | "*Stuka Dive Bomber*" | Oct./Nov., p. 73 |
| Dauntless Software | "*AutoMETAR*" | Dec./Jan., p. 10 |
| Dauntless Software | "Pilot Tools" | Aug./Sep., p. 7 |
| Desktop Wings | "Desktop Wings" | April/May, p. 9 |
| Desktop Wings | "DeskTop Wings" | Dec./Jan., p. 11 |
| Diamond Multimedia | "*Full Throttle* Listens to 3-D Sound Cards" | June/July, p. 25 |
| Digital Image Design | "*Full Throttle* Looks at DID's *Total Air War*" | Feb./March, p. 41 |
| Dynamix | "*Desert Fighters*" | June/July, p. 13 |
| Dynamix | "*Red Baron 3-D*" | Feb./March, p. 73 |
| Electronic Arts | "*Fleet Command*" | Oct./Nov., p. 82 |
| Electronic Arts | "*Full Throttle* Looks at *Jane's WWII Fighters*" | Feb./March, p. 53 |
| Electronic Arts | "*Jane's A-10 Warthog*" | April/May, p. 6 |
| Electronic Arts | "*Jane's WWII Fighters* Arrives" | Feb./March, p. 10 |
| Electronic Arts | "USAF" | Dec./Jan., p. 6 |
| Electronic Arts | "USAF" | Dec./Jan., p. 97 |
| Empire Interactive | "*Apache Havoc*" | June/July, p. 12 |
| Empire Interactive | "*Apache Havoc*" | June/July, p. 68 |
| Empire Interactive | "*MiG Alley*" | Feb./March, p. 7 |
| Empire Interactive | "*MiG Alley*" | Aug./Sep., p. 68 |
| E-publishing Group | "*Comm1*" | Feb./March, p. 77 |
| E-publishing Group | "*Comm1 IFR*" | Dec./Jan., p. 10 |
| E-publishing Group | "*Comm1* Pilot Communications Training" | Feb./March, p. 12 |
| Excelle Corp | "GameSeat" | Aug./Sep., p. 7 |
| Flight One Software | "*Flight Director 99*" | Aug./Sep., p. 63 |
| Flight Safety International | "*Aviator Pro 98*" | Aug./Sep., p. 74 |
| Flight Sim Developers | "A Look at *Concorde SST*" | April/May, p. 76 |
| Flyware | "*Jet Operator 2.03*" | Feb./March, p. 13 |
| G.J. Smith | "*Control 2000* Aircraft Manager" | Feb./March, p. 14 |
| Glenn Copeland | "S.A.L.S." | Oct./Nov., p. 7 |
| Great Planes Model Distributors | "*R/C Pilot*" | June/July, p. 85 |
| Guillemot | "The Latest Advances in 3-D Adapters" | Aug./Sep., p. 55 |
| HabakukSoft | "*Flight Management System II*" | Oct./Nov., p. 8 |
| Hasbro Interactive | "*Gunship III*" | Dec./Jan., p. 12 |
| Horizon Group | "*DirectFlight* Combat Expansion Pack" | Aug./Sep., p. 10 |
| Horizon Software | "*Airbus 2000*" | June/July, p. 12 |
| Horizon Software | "*Combat Expansion Pack*" | Aug./Sep., p. 72 |
| Iain Murray | "*Blue Sky*" | Oct./Nov., p. 6 |
| Infogrames Entertainment | "Combat Flight Sim/Strategy Game" | Feb./March, p. 6 |
| Interactive Associates | "*Airline Simulator 2*" | Aug./Sep., p. 8 |
| Interactive Associates | "*Precision Pilot*" | Dec./Jan., p. 12 |
| Interactive Associates | "*Royal Air Force 2000*" | Oct./Nov., p. 12 |
| Interactive Magic | "*Concorde SST* Supersonic Transport" | Feb./March, p. 16 |
| Jacky Brouze | "*JABGau98*" | April/May, p. 11 |
| JDT LLC | "Radar Contact" Adventure generator | June/July, p.13 |
| JDT LLC | "*Radar Contact* v.1.1" Adventure generator | Aug/Sept., p. 10 |
| JDT LLC | "*Radar Contact 99*" | June/July, p. 72 |
| Jeppesen | "*Sim Charts*" | Oct./Nov., p. 75 |
| JetVision software | "*JetVision 99*" | June/July, p. 14 |
| Joe Jaworski | "*Air Command*" | April/May, p. 9 |
| Kens Software | "FSX 98" | Aug./Sep., p. 13 |
| Lago | "*FSTraffic*" | Dec./Jan., p. 7 |
| Lago | "*Japanese Aircraft Collection*" | June/July, p. 7 |
| Lago | "*Mad Dog*" | June/July, p. 11 |
| Leadtek | "The Latest Advances in 3-D Adapters" | Aug./Sep., p. 55 |
| Logitech | "*Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| Logitech | "Sound All Around" | Oct./Nov., p. 61 |
| Looking Glass Studios | "*Flight Unlimited III*" | April/May, p. 83 |
| Looking Glass Studios | "*Flight Unlimited III*" | Oct./Nov., p. 11 |
| Looking Glass Studios | "*Flight Unlimited III*" | Dec./Jan., p. 22 |
| Looking Glass Studios | "Preview of *Flight Unlimited III*" | Feb./March, p. 63 |
| Lovette Software | "*Course Finder 98*" | April/May, p. 11 |
| LucasArts | "*X-wing Collector Edition* & *X-wing Alliance*" | June/July, p. 80 |
| Marc Philibert | "*FS Meteo*" | Aug./Sep., p. 12 |
| Matrox | "What's New in 3-D Hardware Acceleration?" | April/May, p. 46 |
| Michitaka Suzuki | "*Clouds.Zip*" | June/July, p. 14 |
| Microprose | "*European Air War*" | Feb./March, p. 58 |
| Microprose | "*Gunship III*" | Oct./Nov., p. 69 |
| Microprose | "A Look at *Falcon* 4.0" | Feb./March, p. 65 |
| Microsoft | "*Flight Simulator 2000*" | Oct./Nov., p. 8 |
| Microsoft | "*Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| Microsoft | "Sidewinder Force Feedback Pro" | Aug./Sep., p. 84 |
| Microsoft | "Special *Full Throttle* Look at FS 2000" | Dec./Jan., p. 14 |
| Mindscape | "*Flanker* 2.0" | Dec./Jan., p. 13 |
| NavStar Simulation | "*NavStar 99*" | June/July, p. 10 |
| Novalogic | "*Full Throttle* looks at Novalogic's *F-16 MRF/MiG-29 Fulcrum*" | April/May, p. 51 |
| Nvidia | "The Latest Advances in 3-D Adapters" | Aug./Sep., p. 55 |
| Nvidia | "What's New in 3-D Hardware Acceleration?" | April/May, p. 46 |
| Papa Tango | "*EFIS98: Electronic Flight Instrumentation System*" | Feb./March, p. 11 |
| PC Aviator | "*MegaScenery DownUnder—Victoria*" | April/May, p. 10 |
| PC Aviator | "*MegaScenery Pacific Northwest*" | Feb./March, p. 70 |
| PC Aviator | "*Pacific Northwest*" | Dec./Jan., p. 8 |
| PC Aviator | "*VIP Classic Wings 'The Ultimate Collection'*" | Feb./March, p. 15 |
| Pilot's GesmbH | "*FS Global Upgrade*" | June/July, p. 87 |
| Pitman & Horton | "*PF2EFIS2*" | Feb./March, p. 11 |
| Precision Flight Controls | "PAL Programmable Active Link Keyboard Accelerator" | June/July, p. 78 |
| Precision Flight Controls | "Precision Flight Controls" | Feb./March, p. 82 |
| Precision Manuals | "FS 98 Series 747-400 Aircraft Operating Manual" | April/May, p. 60 |
| Professional Flight Displays | "PFD" | Oct./Nov., p. 7 |
| Rafael Sanchez | "*Visual Object Designer*" | Oct./Nov., p. 64 |
| Rafael Sanchez | "*VOD 3.0*" | Oct./Nov., p. 13 |
| Red Orb Entertainment | "*Myst Masterpiece Edition*" | Oct./Nov., p. 81 |
| Rob Parsons | "*Dem2Ras*" | Dec./Jan., p. 7 |
| Ron Broyles | "Fly VFR 2" | Oct./Nov., p. 12 |
| Saitek | "*Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| Saitek | "PC Dash" | Aug./Sep., p. 87 |
| Sascha Felix | "FS Planner 98" | June/July, p. 9 |
| SCC | "SCC" | Dec./Jan., p. 13 |
| Suncom | "*Full Throttle* Flight Tests the New USB Flight Controllers" | Aug./Sep., p. 59 |
| TAP Publishing | "*WeatherTAP*" | Dec./Jan., p. 10 |
| Technic Direct | "*Aircraft Collection 99*" | Aug./Sep., p. 78 |
| Terminal Reality | "Come *Fly!*, Come *Fly!* away…" | Oct./Nov., p. 14 |
| Terminal Reality | "The *Fly!* Scenery Editor: a First Look" | Dec./Jan., p. 33 |
| Terminal Reality | "A Preview of *Fly!*" | April/May, p. 71 |
| The Associates | "*Luftwaffe Collection*" | Oct./Nov., p. 79 |
| The Associates | "*VIP Classic Airlines*" | Dec./Jan., p. 89 |
| The Associates | "*VIP Ultimate Classic Wings*" | June/July, p. 76 |
| Training Associates | "*Flight Simulator* Information Manuals Training Associates" | April/May, p. 12 |
| Turtle Beach | "Quadzilla Stomps into Town" | Oct./Nov., p. 59 |
| Volition | "*Freespace 2*" | Dec./Jan., p. 92 |
| Voyetra Turtle Beach | "Montego II Quadzilla" | Aug./Sep., p. 11 |
| VRF Corp | "TFCS" | Aug./Sep., p. 13 |
| Wilco Publishing | "*Airport 2000*" | April/May, p. 55 |
| Wilco Publishing | "*Grand Canyon*" | June/July, p. 6 |
| Wilco Publishing | "*Grand Canyon*" | Dec./Jan., p. 87 |
| Wilco Publishing | "*Hang Sim*" | Aug./Sep., p. 6 |
| Xitel | "*Full Throttle* Listens to 3-D Sound Cards" | June/July, p. 25 |

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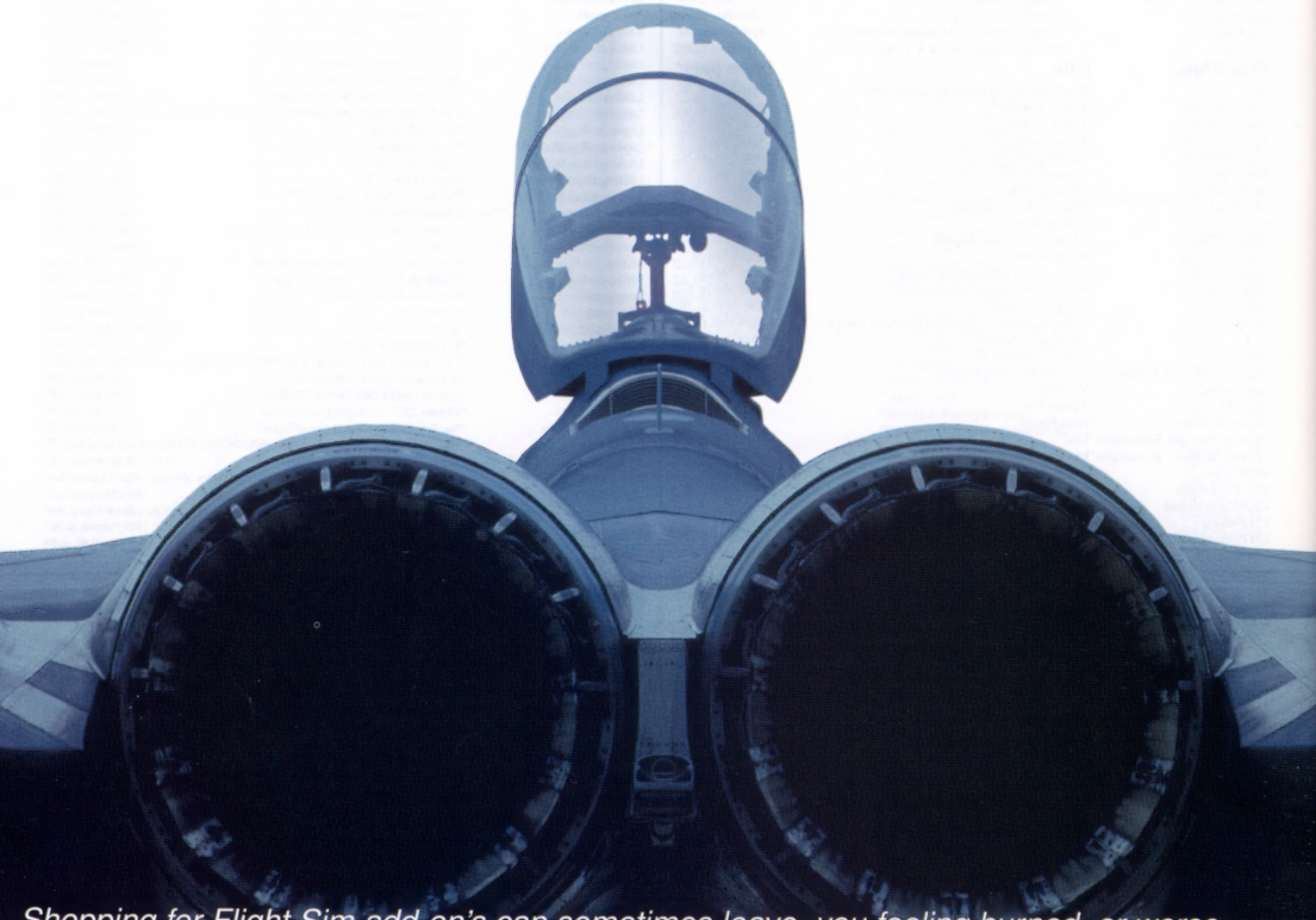

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